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**INFANT SLEEP ARRANGEMENTS IN THE FIRST YEAR:
THE ROLE OF FAMILY SYSTEMS IN SLEEP ECOLOGY AND CHILD
DEVELOPMENT**

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by

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ABSTRACT

Co-sleeping, defined as parents' sleeping with their infants in the same bed or in the same room, is a widespread parenting practice across the world. In Western cultures, however, co-sleeping is not strongly endorsed. Past studies in Western countries have reported the negative impact of co-sleeping practices on infant sleep, family life, and children's socio-emotional development. However, additional studies have not supported the premise that co-sleeping undermines children's healthy development and sleep quality. This suggests that infant sleep arrangements *per se* may not be a determinant of child development. This dissertation aimed to explicate the contradictions in literature regarding the consequences of infant sleeping arrangements and examined the linkages between infant sleeping arrangements, family life, and infant sleep and development, through cultural and family systems perspectives.

Data were drawn from a larger NIH-funded study of 167 families. Study I used multilevel modeling to examine the associations between parenting beliefs, sleeping arrangements, and mothers' perception of infant sleep behavior, and the ethnic group differences in these associations. The results suggested that mothers who co-slept with their infants beyond 6 months (persistent co-sleeping) were more likely than mothers who moved their infants to a separate room by 6 months to report greater frequency of the infant's night waking and perceive the child's night waking to be problematic. Further, when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perceptions of positive co-parenting decreased and negative coparenting increased among persistent co-sleeping families. However, these results were found only among European American families. Sleeping arrangements were unrelated to mothers' perception of infant sleep behavior among ethnic minority families. In addition, the association between inter-parental discrepancies in parenting beliefs and

coparenting quality among ethnic minority families was not significant. Cross-lagged panel models further suggested that when European American mothers perceived a poor alliance with their partner, they brought their infant to the parent's bedroom.

Built on family systems theory, Study II examined whether sleeping arrangements *per se* or family processes were associated with families' well-being in the first year and children's socio-emotional development at a later age. The results of the latent linear growth models for two parallel processes indicated that greater coparenting quality over time was predictive of a reduction in mothers' depression over time. This association was found, independent of whatever sleeping arrangements parents used across the first year. Further, the results of the latent linear growth models suggested that greater coparenting quality over time was predictive of children's fewer externalizing problems, more regulation, and more competency at a later age, independent of whatever sleeping arrangements parents used across the first year. Indeed, sleeping arrangements were related to none of the child outcomes.

Together, the results of this dissertation suggest that (1) it is not sleeping arrangements *per se* but a mismatch between cultural beliefs about sleep arrangements and what parents actually do that leads co-sleeping mothers to be sensitive to infant sleep behaviors and vulnerable to a risk for unfavorable family functioning, and (2) it is not sleeping arrangements *per se* but family processes that play an important role in parents' well-being and children's socio-emotional development. This dissertation provides new insights about the importance of culture and family functioning in studies involving infant sleeping arrangements. Parents, pediatric professionals, and parenting experts must focus less on arguing the benefits or pitfalls of particular sleeping arrangements and, instead, increase their awareness of the importance of the health of the family systems.

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General Introduction

Co-sleeping, defined as parents' sleeping with their infants in the same bed (bed-sharing) or in the same room (room-sharing), is a widespread parenting practice across the world (Barry & Paxson, 1971; Mindell, Sadeh, Wiegand, How, & Goh, 2010). In Western cultures, however, co-sleeping is not nearly as common or as strongly endorsed as it is in non-Western cultures. Many of the U.S pediatric professionals and parenting educators advise against co-sleeping because it is thought to hinder the development of children's independence and their ability to sleep through the night (American Academy of Pediatrics, 2016; Connell-Carrick, 2006; Ramos & Youngclarke, 2006). However, the assumption that co-sleeping is a direct negative influence on children's sleep and development has not been demonstrated with sufficient rigor to warrant strong conclusions (Connell-Carrick, 2006; Ramos & Youngclarke, 2006).

This dissertation aims to address the controversies regarding sleeping arrangements, children's development, and family life to better understand the practice of co-sleeping, and of sleeping arrangements more broadly, through the lenses of culture and family systems. In this introduction, two sets of contradictory results in the literature regarding the consequences of co-sleeping are first introduced. Next, theories and empirical research examining how culture and family systems influence parenting beliefs, choices of sleeping arrangements, perceptions of infants' sleep, and children's sleep and development are reviewed, and how this dissertation, using culture and family systems perspectives, contributes to the existing literature is discussed. Finally, an overview of two proposed studies is provided.

Infant sleeping arrangements: Co-sleeping versus solitary sleeping

Co-sleeping is a worldwide parenting practice. Infants from 200 countries or societies were found to sleep with their mothers in the same bed or same room (Barry & Paxson, 1971).

A recent internet-based study suggests that 86% of children under the age 3 in 12 predominantly Asian countries sleep with their parents in the same room, and 65% sleep with their parents in the same bed (Mindell et al., 2010). Parents in Western countries, however, tend to have their young children sleep in a separate room (solitary sleeping). Sixty three percent of children under age 3 in Australia, Canada, New Zealand, U.K., and U.S. sleep in their own room (Mindell et al., 2010). The majority of the U.S. parents move their infants to a separate room by 6 months (Hauck, Signore, Fein, & Raju, 2008, Kendall-Tackett, Cong, & Hale, 2011; McCoy et al., 2004; Morelli, Rogoff, Oppenheim, & Goldsmith, 1992; Owens, 2004; Teti, Crosby, McDaniel, Shimizu, & Whitesell, 2015). Such parenting practices are consistent with recommendations by pediatric health professionals and parenting experts. The American Academy of Pediatrics (AAP) advises against infants and adults sharing the same sleeping surface (American Academy of Pediatrics, 2016). Parenting advice books also discourage parent-infant co-sleeping. A recent U.S. study of 40 widely-read, parenting advice books about child sleep reported that 72% of these books oppose co-sleeping (Ramos & Youngclarke, 2006), because co-sleeping may hinder the development of children's ability to fall asleep on their own, thereby putting a child at risk for abnormal dependency and poor sleep habits (Sadeh, Mindell, Luedtke, & Wiegand, 2009).

Past studies, primarily cross-sectional, have reported what is described as a negative impact of co-sleeping practices on children's sleep and socio-emotional development. Co-sleeping has been linked to children's insufficient sleep (Sadeh, et al., 2009), persistent night waking and increased bedtime struggles (Deleon & Karraker, 2007; Mindell, Meltzer, Carskadon, & Chrvn, 2009; Ramos, Youngclarke, & Anderson, 2007), and emotional and behavioral problems (Cortesi, Giannotti, Sebastiani, Vagnoni, & Marioni, 2008), as reported by mothers.

Infant sleep arrangements, child development, and sleep: Results of additional studies in the U.S.

Contrary to the results noted above, other studies have not supported the premise that co-sleeping undermines children's healthy development and sleep quality. For example, a retrospective study by Keller and Goldberg (2004) examined associations between sleep arrangements in infancy and toddlerhood and preschoolers' self-reliance. Data from 83 preschool age children and their mothers were collected via maternal reports. Results indicated that the preschoolers whose parents co-slept with them in infancy and toddlerhood as a preferred practice were more likely to be self-reliant, compared with the preschoolers who slept in their own room in infancy and toddlerhood. This study did not support the premise that the solitary sleeping arrangements better promote children's autonomy development than co-sleeping arrangements.

Okami, Weisner, and Olmsted (2002) examined children's developmental outcomes of parent-child bed-sharing. The data from 154 European American families were collected for 18 years from the 1970's, during which pronaturalism (e.g., endorsement of more "natural" child care practices such as co-sleeping or long breastfeeding periods) was popular (See Okami, Weisner, & Olmsted, 2002). Six waves of longitudinal data included observational assessments by professionals, interviews, and parent and adolescent questionnaires. Sleep arrangements that parents regularly used were identified through questionnaires and interviews at children's age 5 months, and 3, 4, and 6 years, and were compared with child outcomes at age 6 (cognitive competence, behavioral and emotional maturity, mood and affect, school adjustment, and creativity assessed by professionals), and at age 18 (relationships with parents, other adults, and peers, self-acceptance, conduct problems, and substance abuse reported by adolescents). The

results showed that bed-sharing was not associated with any outcomes at age 6. Moreover, there was no indication of any negative or positive correlates of childhood bed-sharing and adolescent outcomes at age 18. This study suggests that co-sleeping may not compromise healthy socio-emotional development.

Further, recent longitudinal studies using both subjective and objective sleep measures demonstrated that sleeping arrangements were unrelated to infants' sleep. Volkovich, Ben-Zion, Karny, Meiri, and Tikotzky (2015) examined sleep patterns of co-sleeping and solitary sleeping infants and mothers. Sleep data from 153 Israeli families were collected, using sleep diary and actigraphy, during the third trimester of pregnancy and at 3 and 6 months of postpartum. The results revealed that although mothers of co-sleeping infants reported greater infant night wakings than mothers of solitary sleeping infants, none of the actigraphy data (minutes awake after sleep onset, sleep minutes from sleep onset to morning awaking, number of night-waking lasting five minutes or longer, or longest sleep period without waking) was different between co-sleeping infants and solitary sleeping infants at 3 months as well as 6 months. Moreover, compared with mothers of solitary sleeping infants, co-sleeping mothers showed greater sleep disturbances measured by both actigraphy and sleep diaries. This study demonstrated that the higher rate of sleep disturbances in co-sleeping mothers was not directly related to their infant's sleep.

Teti, Shimizu, Crosby, and Kim (2016) investigated the associations between infant sleeping arrangements parents used across the first year of life, infants' and parents' sleep quality, family functioning, and bedtime parenting quality, in a sample of 139 U.S. families. Infant sleeping arrangements were defined in terms of the patterns of infant sleeping arrangements parents used across the first year of life. Similar to Volkovich et al.'s findings

(2015), mothers who co-slept with their infants beyond 6 months of infant age (i.e., persistent co-sleeping) reported more frequent night waking in their infants, but mothers' reports were not supported by actigraph assessments of infant sleep. Instead, actigraph records indicated that persistent co-sleeping was associated with sleep disruption in mothers but not in infants, in comparison to mothers whose infants slept in a separate room from parents by 6 months.

Collectively, the results of the studies examining relations between infant sleep arrangements, child sleep, and child outcomes are mixed. This raises the question: Why are there contradictions in literature regarding the consequences of infant sleeping arrangements?

Contribution to existing literature: Examining the links between infant sleeping arrangements, child development, and family life through cultural and family systems perspectives

My dissertation is motivated by the commonly-held Western perspective that persistent co-sleeping is predictive of unfavorable family health, infants' sleep, and child development. It aims to explicate the contradictions in literature regarding the consequences of infant sleeping arrangements.

Indeed, infants' sleep and development are intricately determined. Sadeh and Anders (1993) adapted Sameroff's transactional model (1989, 2000) and proposed a transactional model of infant sleep. This model emphasizes the dynamic linkages between environmental factors, parental factors, and infant sleep. It suggests that cultural norms shape parents' expectations regarding infant sleep, and the parents' expectations in turn influence their parenting practices, which influence infant sleep. This model also suggests that families can be a source of support or a source of stress. Family dynamics also influence parents' well-being, which also affects infant sleep. Although the model does not directly address infant sleep arrangements, it does

suggest that cultural norms and family systems are of primary importance in predictions of parental well-being, parents' expectation regarding infants' sleep, and infant sleep and development.

This dissertation concentrates on the controversy that has developed around the benefits and pitfalls of infant sleeping arrangements, children's development, and family life through cultural and family systems perspectives. The following section will provide an overview of the theory and empirical evidence regarding the influences of culture on parenting beliefs and mothers' perceptions of their infants' night waking, and the influences of family systems on parents' well-being and infants' sleep and development.

Culture and parenting beliefs

Cultural values influence parents' parenting beliefs, which influence parents' choices of infant sleep arrangements. The developmental niche theory (Super & Harkness, 1986) suggests that three elements – social settings, the customs of child care, and the psychology of the caregivers – maintain homeostasis by keeping the three elements in harmony with each other. This culture-practice-ethnotheory maintenance system is most evident in how parents structure infant sleep (Super & Harkness, 1986).

Markus and Kitayama (1991) identified the psychological attributes and generalized traits of individuals in Western countries and non-Western countries: the independent view of the self and the interdependent view of the self. The independent model indicates that individuals in the Western countries are more likely to value independence, whereas individuals in the collectivistic countries value social harmony and closeness. Thus, it is assumed that the goals of parenting are to socialize children to develop cultural construals of the self (Chao, 1995). In support of this, past work suggests that infant solitary sleeping is common in Western countries,

where parents value children's independence from others, whereas co-sleeping is normative in collectivistic countries, where parents value a sense of closeness (Caudill, & Plath, 1966; Giannotti, & Cortesi, 2009; Jenni, & O'Connor, 2005; Latz, Wolf, & Lozoff, 1999; Morelli et al, 1992; Owens, 2004).

Of course, not all parents in Western countries engage in infant solitary sleep, and there are within-culture differences in parenting beliefs and parenting practices (Lamm, & Keller, 2007). However, parents in Western cultures who voluntarily choose co-sleeping as their preferred arrangement appear to value intimate, close relationships between parents and the child, whereas parents who engage in infant solitary sleep value infants' autonomy. For example, Germon, Chang, Keller, and Goldberg (2007) asked the U.S. parents about the reasons for the sleeping arrangement they used for their infants. The majority (60 %) of the parents who intentionally chose to co-sleep with their children as their preferred practice endorsed the development of the infants' emotional security. About half (45 %) of the parents who engaged in solitary sleep arrangement strongly supported the development of the child's independence, but the parents who intentionally co-slept with their child rarely considered promoting child independence as a reason for co-sleeping. This indicates that co-sleeping is linked to the parental beliefs that value healthy socio-emotional development, whereas solitary sleeping is related to the parental beliefs that value the child's autonomy development, and this linkage is evident even in Western culture, where solitary sleeping is highly endorsed.

Culture and mothers' perceptions of infant night waking

Cultural norms determine the boundaries between normal and problematic sleep behavior (Jennie & O'Conner, 2005). The match or mismatch between parenting beliefs and sleeping arrangements parents use influences parents' perceptions of what is considered to be "normal" or

“problematic” infants’ sleep behaviors. For example, Luijk et al., (2013) examined ethnic differences in mothers’ perceptions of infants’ sleep behavior among the Dutch, Turkish, Moroccan, and Caribbean mothers in the Netherlands. Infants’ sleep problems were associated with greater odds of bed-sharing in Dutch mothers, but not in non-Dutch mothers, the majority of whom co-slept with their infants.

Two subtypes of co-sleeping have been identified, which appear to be linked to parental perceptions of child sleep problems: parents who do not prefer co-sleeping but use this arrangement in reaction to the child’s sleep problems (reactive co-sleeping) and those who prefer co-sleeping because of the beliefs that maintaining close infant-parent contact promotes parent-infant bonding (proactive co-sleeping). Keller and Goldberg (2004) and Ramos and her colleague (2007) found that reactive co-sleeping parents viewed their child’s sleep disruptions as problematic, but proactive co-sleeping parents rarely did.

These studies suggest that reactive co-sleeping mothers tend to perceive their child’s night waking behaviors as problematic, but for proactive co-sleeping mothers, their child’s night waking behavior is not a problem. This work also suggests that parents of European descent may be more likely to endorse solitary infant sleep to a greater degree than non-European parents, who may be more likely to embrace co-sleeping. That is, Luijk et al.’s (2013) findings suggest that among Western European mothers, when there is a mismatch between culturally prescribed parenting beliefs and the sleeping arrangements parents use, mothers tend to view their child’s sleep behavior as problematic. However, to my knowledge, few studies have examined the differences in these linkages between European American families and ethnic minority families. This dissertation examined the associations between parenting beliefs, sleeping arrangements, and mothers’ perceptions of infant sleep behavior, and whether European

American families or ethnic minority families are at risk for elevated family stress and perceived child sleep problems when they choose persistent co-sleeping arrangements for their infants.

Family systems theory

Family systems theory views the family as an organized system and the individual as a contributor to the family (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985). The core idea of family systems theory is that the whole is greater than the sum of its parts. This suggests that an individual is a part of an organized family system; hence, any individual within the family is interdependent, and can only be understood in a family context (Cox & Paley, 1997; Minuchin, 1985). Indications of family functioning tend to be holistic characteristics of a family (e.g., cohesive versus non-cohesive, rigid versus semi-permeable boundaries). Family processes, by contrast, refer to dynamic, adaptational or maladaptational processes that contribute to the stability or change in family functioning. This is an important distinction that will be addressed in this dissertation.

Family functioning: Subsystem

The family system is composed of smaller subsystems: parent, sibling, and parent-child subsystems (Minuchin, 1974; Minuchin, 1985). In two-parent families, the parent subsystem is composed of a husband and a wife or functionally equivalent cohabiting caregiving partner. This system can serve as a refuge from external stress, characterized as mutual support, and performs the tasks of socialization as an executive function, where parents use authority to nurture, guide, and control the child. Once the second child comes along, children form the sibling subsystem learn how to negotiate, cooperate, and compete. Each of the subsystems is interdependent, and the patterns of functioning within one family subsystem impact the functioning within other subsystems (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985).

Family functioning: Boundaries

Subsystems are governed by boundaries so as to protect differentiation of the system (Minuchin, 1974). Minuchin (1974) emphasizes that the parent system must achieve a boundary that protects it from interference by the demands or needs of members in other subsystems. Because the problems within the parent subsystem tend to extend to other parts of the family system, it is crucial to maintain a clear but permeable boundary that allows the child access to both parents while excluding the child from the parental functions (Minuchin, 1974). Most families successfully adapt to changing conditions or development of a child by drawing new lines and modifying family rules over time, but dysfunctional families have problems in maintaining boundaries (Minuchin, 1985).

Boundary problems can arise when one subsystem constantly uses the same nonmember to diffuse conflicts within a subsystem (Minuchin, 1974). In such families, the boundary between subsystems becomes blurry, and the differentiation of the systems diffuse. In contrast, boundary problems can arise when families develop rigid boundaries, which makes communications across systems difficult (Minuchin, 1974). These two polar opposite boundary disturbances are defined as enmeshment (overly diffuse boundaries) and disengagement (rigid boundaries) (Minuchin, 1974). For example, an enmeshed mother-child subsystem would exclude the father by creating a rigid cross-generational coalition against the father. As a result, healthy child development, for example, autonomous exploration and mastery of problem-solving skills, would be discouraged by the intrusive mother. In contrast, disengaged families may be indifferent to guiding the child's healthy development. Olson, Russel, & Sprenkle (1983) later extended this model and defined the midrange of the continuum as cohesion, which is considered the optimal family functioning.

In line with family systems theory, past work has demonstrated that children from harmonious, cohesive families are healthy and free of adjustment problems (Jacobvitz, Hazen, Curran, and Hitchens, 2004; Richmond & Stocker, 2006; Sturge-Apple, Davies, & Cummings, 2010), whereas children from enmeshed families are more likely to exhibit adjustment problems such as elevated depression (Jacobvitz et al., 2004), internalizing behavior, and difficulties in emotional adjustment (Sturge-Apple et al., 2010). Children from disengaged families are also at risk for emotional as well as behavioral adjustment problems (Jacobvitz et al., 2004; Sturge-Apple et al., 2010). Importantly, the linkages between family functioning and children's emotional and behavioral adjustment have been also demonstrated in non-Western countries (Camarano, & Ivans, 2008, Gjerde & Shimizu, 1995; McHale, Rao, & Krasnow, 2000; Ogata & Miyashita, 2000), suggesting that the basic tenets of family systems theory transcend culture.

Family processes: Homeostasis

Family systems have homeostatic features that maintain the stability of the patterns, such that any behaviors that deviate from the system's threshold of tolerance elicit a mechanism that works to return the family to the previously established range of change. This equilibrium tends to revolve around well-established and learned patterns, even if these patterns are maladaptive (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985).

When challenging external forces disrupt the established patterns, the system moves away from equilibrium until it is reestablished (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985). Families are required to change existing patterns by seeking alternatives, create new patterns, and adapt to the changes in circumstances, but when the adaptation is not successful, the system stays in disequilibrium. In dysfunctional families, this process may incorporate a family member's psychological symptoms or maladaptive behavior so as to compensate for the

changing condition, which may further hinder the family's capacity to seek alternatives (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985). Thus, depression or emotional/behavioral problems are considered reflective of the family maladaptation (Cox, & Paley, 1997; Minuchin, 1974).

Although many studies have addressed linkages between family functioning and children's outcomes, only one study has examined relations between dynamic family processes and child development. Johnson (2003) examined the influence of stability of, or changes in, family functioning on children's emotional and behavioral problems during the transition to elementary school. In her short-longitudinal study, families were invited to a laboratory, and family interactions were videotaped when children were in kindergarten (W1) and at 4th grade (W3). Family cohesion, marital relationships, mother-child relationships, and father-child relationships were coded. Further, teachers reported the degree of the child's externalizing behavior when children were at 1st (W2) and 4th grade (W3). A cluster analysis identified three clusters at W1 and W3, but with different typologies. A cohesive family system, a strong father-child subsystem, and a strong mother-child subsystem were identified at W1, whereas a cohesive family system, a disengaged family system, and a strong father-child subsystem were identified at W3. Analyses revealed that when families were cohesive at both W1 and W3, child externalizing was not found at both W2 and W3. Interestingly, when families were not cohesive at W1, but cohesive at W3, externalizing behavior diminished from W2 to W3. However, when families were not cohesive at both W1 and W3, child externalizing behavior increased from W2 to W3. This study suggests that not only family functioning at one point in time but the stability of, or changes in, good family functioning over time also influences children's developmental outcomes.

Family functioning, parents' sleep and well-being, and infant sleep

Although a single study (Johnson, 2003) has addressed linkages between family processes and children's socio-emotional outcomes, research examining linkages between family functioning on infant sleep is still limited. To date, there have been only three studies conducted in this area, and they have demonstrated strong linkages between spousal or coparental relationships, parental well-being, and infant sleep, with evidence that influences between family functioning and infant sleep is bidirectional. For example, Meijer and van den Wittenboer (2007) examined the influence of infants' night crying on marital relationships in first time parent couples. They found that marital satisfaction decreased as the frequency of infants' nighttime crying increased. Tikotzky, Sadeh, and Glickman-Gavrieli (2011) investigated an association between infant sleep and paternal involvement in infant caregiving during the first 6 months of life. Greater father involvement in caregiving at 1 month predicted fewer infant night wakings at 6 months. Moreover, father involvement in infant care at 6 months was also associated with fewer infant night wakings at 6 months. McDaniel & Teti (2012) examined coparenting quality during the first three months after birth. A path analysis revealed that, at both 1 and 3 months, the frequencies of infant night waking predicted mothers' and fathers' poor sleep quality, which predicted both parents' elevated depressive symptoms, which in turn predicted coparenting distress. Further, positive coparenting at 1 month was predictive of decreased depressive symptoms at 3 months. Collectively, these studies suggest that good spousal/coparenting relationships and paternal support in caregiving may buffer any untoward effects of infant night waking on parents' distress and couple distress during the transition to new parenthood.

Family processes, parents' sleep and well-being, and infant sleep

As mentioned earlier, family systems theory posits two features of family systems: family functioning and family processes (Cox, & Paley, 1997; Minuchin, 1974; Minuchin, 1985). Healthy, cohesive families successfully adapt to changing circumstances over time, and reorganize family patterns by exploring alternatives so as to continue functioning (family processes). Parents bond with each other and nurture the infant by maintaining mutually supportive marital relationships (family functioning). Unhealthy families, however, encounter difficulty in adaptation to changing circumstances by rigidly adhering to preexisting schemas. Psychological symptoms or maladaptive behaviors may develop as a way to compensate for a changing condition, and further problems may arise through the cycle of maladaptive interactions (family processes). Marital discord occurs, and healthy child development is compromised. Boundaries become rigid or diffuse, manifested as distant or intrusive parenting (family functioning). As can be seen, family systems theory involves an interplay between family functioning and processes which occur within the family that contribute to family functioning.

Past work has demonstrated that children's sleep problems were associated with active soothing techniques (e.g., rocking, holding), parental presence at sleep onset, or bringing the infant into the parental bed (Fehlings, Weiss, & Stephens, 2001; Morrell & Cortina-Borja, 2002; Touchette, et al. 2005; Teti & Crosby, 2012; Weinraub et al. 2012), which was found to further increase infant night waking (Mindell & Owens, 2003). It is hypothesized that infants develop an association between sleep onset and parents' assistance (Ferber, 1987). Further, persistent child sleep problems were shown to be associated with mothers' poor sleep quality (Dorheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009; Goyal, Gay, & Lee, 2007; Mindell, Sadeh, Kwon,

& Goh, 2015), mood disturbance (Hiscock & Wake, 2002; Lam, Hiscock, & Wake, 2003), fatigue (Dennis, & Ross, 2005), depression (Hiscock & Wake, 2001; Teti & Crosby, 2012; Wake et al., 2006), and marital conflict (Meijer & van den Wittenboer, 2007). Using family systems theory, the results of sleep research may be interpreted as follows: Distressed parents in non-cohesive families may be prone to soothe to fall sleep by rocking, holding, nursing, or lying next to the infant. The infant, in turn, may develop sleep onset associations through repeated experiences of being soothed by parents, and infants' capacities to sooth themselves to sleep become compromised because it is the parents, not the infants, who are soothing the infants to sleep. This in turn can foster more frequent infant sleep disturbances as infants become more and more dependent on parents to settle to sleep. Parents in turn may experience increased sleep disturbances and fatigue. As parents' sleep is further disturbed, parents may become more irritable and dysphoric, which in turn fosters marital conflict. These parents, specifically the mother, may develop feelings of hopelessness, elevated depressive symptoms, and excessive worries about their infants' sleep. The elevated emotional distress, in turn, leads her to be hyper-reactive to any signs of infant awakening and to bring the baby to the parent's bed. This, in turn, may further intensify the infant's sleep disturbances.

Problems in dysfunctional families are amplified through the cycle of family interactions. In such families, disengaged or enmeshed parent-child relationships are more likely to occur, and families remain in disequilibrium as they attempt to cope with what is perceived as a persistent infant sleep problem. In contrast, parents in cohesive families successfully manage infant sleep problems through adequate communications, negotiations, and mutual support, and successfully adapt to the circumstances by changing rules, roles, and parenting strategies. Thus, cohesive families are more likely than disengaged or enmeshed families to maintain family equilibrium

over time. However, in contrast to the studies examining the influences of family functioning on parents' sleep, parents' well-being, and child sleep and development, longitudinal research on family processes (how families adapt to changing circumstances over time) has been scant. As Jonson's study (2003) suggests, family processes, or changes in family functioning over time, may also influence children's sleep and socio-emotional development. Thus, this dissertation examined how family processes (i.e., changes in family functioning over time) are associated with parents' sleep and well-being, and infants' sleep and development.

Main research questions

Given the empirical evidence that infant sleep arrangements *per se* may not be a direct influence on children's autonomy, socio-emotional problems, or sleep development, this dissertation aims to examine in detail the linkages between infant sleeping arrangement patterns, family life, and infant sleep and development, through cultural and family systems perspectives. Past work has demonstrated that (1) co-sleeping is linked to the parental beliefs that value healthy socio-emotional development, whereas solitary sleeping is related to the parental beliefs that value the child's autonomy development, (2) when there is a mismatch between parenting beliefs and the sleeping arrangements parents are using, mothers, particularly those in Western nations that endorse solitary sleep, tend to view their child's sleep behavior as problematic, and (3) good coparenting relationships may buffer any untoward effects of infant night waking, parents' distress, and negative emotionality toward the infant, and this is expected to be characteristic of all families regardless of culture and regardless of parents' choice of infant sleeping arrangement. Interestingly, although family systems theory provides some theoretical insight into differential linkages between infants' sleep, parents' sleep, and parents' well-being, by family processes (i.e., changes in family functioning over time), very little research to-date

has paid attention to this matter.

This dissertation addresses the following research questions.

Study I:

1. Does the linkage between mother's perception of their infants' sleep behavior and the sleeping arrangements parents used for their infants differ between European American families, where solitary sleeping is normative, and ethnic minority families, where co-sleeping may be more culturally endorsed?
2. Are there discrepancies in parenting beliefs about infant sleeping arrangements between mothers and fathers? If so, will the inter-parental discrepancies spill over and predict into higher levels of family dysfunction? Further, does the linkage between parenting beliefs and family functioning differ by infant sleeping arrangements (co-sleeping versus solitary sleeping) and by families' ethnic background (European Americans versus ethnic minorities)?

Study II:

1. Are family processes (changes in family functioning) associated with various measures of an individual's functioning within a family, after controlling for sleeping arrangements?
2. Are trajectories of change in coparenting quality (family processes) linked to infants' sleep and socio-emotional development at a later age, after controlling for sleeping arrangements?

Study I: Parents' discrepancies in parenting beliefs for choices of infant sleep arrangements and family functioning in the first year

Cultural values shape parents' parenting beliefs, which influence their parenting practices. From prior work (Germino et al., 2007; Luijk et al., 2013; Sadeh, Tikotzky, & Scher,

2010), parents of Western European background appear to be more likely than non-European parents to have their infants sleep in a separate room and endorse the belief that solitary sleeping promotes child independence, whereas non-European parents may be more likely to engage in co-sleeping because of culturally-based beliefs that co-sleeping is good for the baby, or that it fosters close parent-infant relationships. As a corollary, parenting beliefs also influence parents' expectations about and perceptions of infant sleep, which is evinced by the higher rates of infants' sleep problems reported by mothers who endorse child independence but co-sleep with their child in reaction to the child's sleep problems than by the mothers who choose to co-sleep with their child because co-sleeping is more consonant with their parenting beliefs or cultural prescriptions (Keller & Goldberg, 2004; Luijk et al., 2013; Ramos et al., 2007). Thus, mismatches between what a parent believes about infant sleep arrangements and what sleep arrangements parents actually use may be predictive of a parent's perception of infant night awakenings.

Germo et al. (2007) further suggests that mothers' perceptions of their child's sleep behavior and the discrepancies between parents in parenting beliefs regarding sleeping arrangements may spill over into co-parental conflict. Thus, the quality of family functioning may be a product not only of the degree to which there is a match between parental beliefs about sleep arrangements and what parents actually do, but also of the degree to which there is inter-parental agreement in parenting beliefs about sleep arrangements. Extending Germo et al.'s study (2007), Study 1 of this dissertation examined whether the linkage between mothers' perception of their infants' sleep behavior and the infants sleeping arrangements parents used differ between European American (EA) and ethnic minority families, and whether the linkages between parents' discrepancies in parenting beliefs and family functioning differ between (a)

families who co-sleep with their infants and families whose infants slept in a separate room, and (b) between EA families and ethnic minority families, during the first year of infant age. I expected that mothers' perceptions of infant sleep problems would be higher among EA co-sleeping mothers than among EA mothers of solitary sleeping infants, but mothers' perceptions of infant sleep problems would be less strongly related to sleeping arrangements among ethnic minority mothers. I also expected that when EA co-sleeping mothers or fathers endorse close parent-child relationships but have discrepancies in endorsing close parent-child relationships with their partner, they report poorer quality of coparenting than EA parents of solitary sleeping infants. Similarly, when ethnic minority mothers or fathers of solitary sleeping infants endorse child independence but have discrepancies in endorsing child independence with their partner, they would report poorer quality of co-parenting than ethnic minority parents who co-slept with their infants. That is, I expected that the spill-over effects of inter-parental discrepancies in parenting beliefs about choices of sleeping arrangements on coparenting quality would be stronger when parents used the sleeping arrangement that was dissonant with their cultural norms than when parents used the sleeping arrangement that was consonant with their cultural norms.

Study II: The roles of family processes in infant sleep and development in the first year

Infant sleep disturbances have been shown to be associated with parents' reduced sleep (Dorheim et al., 2009; Goyal et al., 2007; Mindel et al., 2015), depression (Hiscock & Wake, 2001; Wake et al., 2006), and parenting stress (Thome & Skuladottir, 2005). Bidirectional linkages between infants' sleep, parents' sleep, and parents' well-being have been investigated (Philbrook & Teti, 2016; Sadeh, Tikotzky, & Scher, 2010), yet research into the role of a more distal environment (culture and family) in infants' sleep, parents' sleep, and parents' well-being is still very underdeveloped. Family systems theory views the family as an organized system and

examines the processes that create and maintain the patterns that regulate behaviors (Minuchin, 1974). It is a theory whose basic tenets have been cross-culturally validated (McHale et al., 2000). In the context of infant sleep, stressed coparenting may lead to infant sleep disturbance, parents' chronic sleep deprivation, and heightened vulnerability to negative affect. This would compromise child development, independent of whatever sleep arrangements parents use. Study II examined two inter-related questions: (a) Are the trajectories of coparenting quality (family processes) associated with infants' sleep, parents' sleep, and parents' well-being?, and (b) Are trajectories of coparenting quality linked to infants' sleep and socio-emotional development at a later age? Does the associations in (a) and (b) still remain, after controlling for sleeping arrangements?

Study I

Parents' Discrepancies in Parenting Beliefs for Choices of Infant Sleep Arrangements and Family Functioning in the First Year

Introduction

Parents who engage in co-sleeping tend to believe that co-sleeping fosters closer parent-infant relationships, whereas parents whose infants sleep in a separate room tend to endorse the belief that solitary sleeping promotes child independence (Germo, Chang, Keller, & Goldberg, 2007; Sadeh, Tikotzky, & Scher, 2010). However, parents are not always in agreement. Disagreement about infant sleeping arrangements may spill over into unhealthy family dynamics. In the present study, I examined the linkage between mothers' perceptions of infant sleep problems and sleeping arrangements parents used for their infants, and the linkages between inter-parental discrepancies in parenting beliefs about choices of sleeping arrangements, family functioning, and sleeping arrangements parents used. Taking the influence of culture into account, I also examined ethnic group differences in these linkages.

Cultural values, parenting beliefs, and infant sleeping arrangements

Parenting practices are embedded in indigenous parenting goals. Markus and Kitayama (1991) identified the psychological attributes and generalized traits of individuals in individualistic countries (i.e., Western countries where the self is prioritized over a group) and collectivistic countries (i.e., non-Western countries where one's group is prioritized over the self) that remained stable across situations, termed the independent view of the self and the interdependent view of the self, respectively. The independent model indicates that individuals in individualistic countries tend to view the self as an independent entity from others and value one's autonomy and uniqueness (Markus & Kitayama, 1991). On the other hand, the

interdependent model suggests that individuals in collectivistic countries view the self as part of the group and endorse connectedness and social harmony (Markus & Kitayama, 1991). Thus, the goals of parenting are to socialize children to develop cultural construals of the self (Chao, 1995). Parents in individualistic and collectivistic countries engage in different parenting strategies to achieve these goals (Chao, 1995; Keller, Völker, & Yovsi, 2005; Keller et al., 2006; Keller et al., 2007).

For example, a study examining the differences in parenting beliefs between European American and Chinese mothers reported that European American mothers were more likely to endorse a child's independence, self-confidence, self-assertiveness, and self-actualization, whereas Chinese mothers were more likely to endorse a child's ability to have harmonious relationships with others (Chao, 1995). Another study examined the socialization goals of Caucasian mothers from independent countries (Germany, U.S., and Greece) and non-Caucasian mothers from collectivistic nations (rural India and Cameroon), and demonstrated that the independent model of parenting, characterized as less emphasis on family allocentrism and more emphasis on self-confidence and autonomy development, was linked to the memberships in the independent countries, whereas the interdependent model of parenting, characterized as greater emphasis on family allocentrism and caring for others, was related to the membership in the collectivistic nations (Keller et al., 2006). Not surprisingly, parents' parenting beliefs are linked to parenting behaviors. Cross-cultural studies suggested that mothers in collectivistic countries were more likely to engage in holding and touching with their infants and value emotional bonding between parents and an infant, whereas mothers in individualistic countries were less likely to have bodily contact with their infants but more likely to encourage object exploration and endorse children's independence (Keller et al. 2005; Keller et al., 2007).

Infant sleep arrangements, ranging from having infants sleep in a separate room from parents (solitary sleep) to sleeping in the same room or bed as the parents' (co-sleeping), appears to be culture-bound. Of course, infant sleeping arrangements are influenced by feeding methods parents use (Ball, 2003), ease of nocturnal caregiving (McKenna & Volpe, 2007), children's illness (Ball, 2002), and other considerations (Teti, Shimizu, Crosby, and Kim, 2016), yet past work reported that how parents structure infant sleep at least in part represents parents' parenting beliefs. In Western countries, where children's independence is greatly emphasized, infants are encouraged to sleep in a separate room from parents from early months of infant age to promote self-soothing skills (the ability to sooth oneself back to sleep) (Brazelton & Sparrow, 2003; Giannotti, & Cortesi, 2009; Jenni, & O'Connor, 2005; Latz, Wolf, & Lozoff, 1999; Morelli, Rogoff, Oppenheim, & Goldsmith, 1992; Owens, 2004). On the other hand, in non-Western countries where closeness and connectedness is highly endorsed, co-sleeping is believed to promote parent-child bonding (Caudill, & Plath, 1966; Giannotti, & Cortesi, 2009; Jenni, & O'Connor, 2005; Latz et al., 1999; Morelli et al., 1992; Owens, 2004). Thus, cultural values shape parents' parenting beliefs, which influence their parenting practices.

Cultural values and infant sleeping arrangements in the U.S.

The U.S. has an ethnically diverse population, broadly classified into European American and the three other large groups (African, Asian, and Hispanic Americans). Although there is variability in the individualism-collectivism cultural value orientations within ethnic minority groups (e.g., Coon & Kemmelmeier, 2001; Oyserman, Coon, & Kemmelmeier, 2002), African, Hispanic, and Asian Americans appeared to be higher in collectivism, compared to European Americans (Chao, 1994, 1995; Chao & Tseng, 2002; Schwartz, Unger, Zamboanga, & Szapocznik, 2010).

For example, a recent study, with a sample of 1,800 young adults across the U.S., examined whether the cultural values of ethnic minority groups (*communalism* held by African Americans, *familism* by Hispanic Americans, and *filial piety* by Asian Americans) would tap onto a single latent construct, and whether this latent construct would be associated with the collectivism cultural orientations and the self-construal of interdependence (Schwartz et al., 2010). Results indicated that European Americans scored lowest on communalism, familism, and filial piety. As expected, communalism, familism, and filial piety tapped onto a single latent factor, named family/relationship primacy, and African Americans, Hispanics, and Asians were higher in family/relationship primacy than European Americans. Further, family/relationship primacy was highly correlated with collectivism ($r = .72$) and interdependent self-construal ($r = .53$). This study demonstrated that a more collectivistic, interdependent cultural value was strongly endorsed by these ethnic minority groups than among European Americans.

Given the association between collectivistic, interdependent cultural beliefs and infant co-sleeping arrangements, it is perhaps not surprising that the frequency of co-sleeping is higher among African, Hispanic, and Asian Americans than among European Americans. Nationally representative studies reported that African American, Hispanic, and Asian parents were less likely than European American parents to place their infants in a separate room (Fu, Colson, Corwin, & Moon, 2008; Hauck, Signore, Fein, & Raju, 2008; McCoy et al., 2004; Willinger, Ko, Hoffman, Kessler, & Corwin, 2003). African and Asian American infants under 7 months were 4-6 times and 3-7 times, respectively, more likely to sleep on a parents' bed than European American infants (Fu et al., 2008; McCoy et al., 2004; Willinger et al., 2003). Hispanic American infants under 8 months were 3 times more likely to sleep in the parents' room (Fu et al., 2008). Although empirical research examining ethnic differences in cultural values,

parenting beliefs, and parents' choices of their infants' sleeping arrangements has been scant in the U.S., given the theoretical associations between cultural values, beliefs, and practices as well as the empirical findings noted above, it is reasonable to conclude that European American parents tend to encourage their infants to sleep in a different room to promote self-regulated sleep, whereas ethnic minority parents tend to endorse co-sleeping to promote close parent-child relationships.

Sleeping arrangements and children's sleep

The consequences of co-sleeping practices are controversial, and, in Western cultures, generally thought to be problematic. Persistent co-sleeping is associated with persistent child night waking and bedtime struggles (Mao, Burnham, Goodlin-Jones, Gaylor, & Anders, 2004; Mindell, Meltzer, Carskadon, & Chervin, 2009; Sadeh, Mindell, Luedtke, & Wiegand, 2009) and poor sleep quality of infants (Sadeh et al., 2009; Touchette et al., 2005). It should be noted, however, that these linkages are primarily reported by self-report studies in which the majority of the sample were European American.

In fact, several explanations challenge the linkages between co-sleeping and infants' sleep disturbances. First, past work reported that parents' perceptions about infant sleep behavior and whether or not it is viewed by parents as problematic depend largely on the parents' cultural heritages. Individuals with collectivistic backgrounds prioritize the needs of family members over one's own needs (Hofstede, 1980; Hsu, 1983; Markus & Kitayama, 1991). This is a main feature of a collectivistic value orientation which entails self-sacrifice (Markus & Kitayama, 1991; Triandis, 1995). Thus, one's cultural value determines what normal or problematic sleep behavior is (Jenni & O'Conner, 2005). For instance, a survey study in a sample of 218 Korean mothers revealed that, although 83% of the mothers noticed their infants'

frequent night waking and 28% reported their infants' nighttime crying, the majority (84%) of the mothers did not consider their infants' sleep behavior as problematic, and exhibited tolerance to their infants' sleep disruptions as a process of normal development (Lee, 1992). In a study cross-culturally examining sleep practices and problems in young children in the U.S. and Japan, U.S. mothers reported greater episodes of their child's stressful sleep problems than Japanese mothers did, although the majority (85%) of the U.S. mothers did not regularly sleep with their child in physical proximity (Latz et al., 1999). Further, the U.S. mothers who regularly slept with their child in proximity reported significantly higher child night waking than their Japanese counterparts (Latz et al., 1999). This study demonstrated that it may not be that the mothers who slept with their child in physical proximity had a tendency to notice their child's sleep problems, but that there may be differences between U.S. mothers and Japanese mothers in the threshold of whether they consider their child's night waking to be a problem.

Similarly, several studies in the U.S. have reported ethnic differences in parents' perception of whether their child's sleep behavior is problematic. A survey study, examining ethnicity and socioeconomic status (SES) differences in prevalence of co-sleeping and children's sleep problems, demonstrated that the frequency of regular co-sleeping was higher in lower SES families than higher SES families for European Americans, but African American families routinely co-slept with their children regardless of SES (Lozoff, Askew, & Wolf, 1996). European American parents who regularly co-slept with their children were more likely than African American parents who did so to view their child's sleep behavior as problematic, conflicting, distressing, or upsetting (Lozoff et al., 1996). Moreover, a recent nationally representative study revealed that European American mothers were more likely than African and Hispanic American mothers to report concerns about their child's sleep, even after

controlling for marital status, maternal age, maternal education, poverty levels, household crowding, and children's sleep locations (Milan, Snow, & Belay, 2007). Thus, parents' cultural beliefs determine what normal or problematic children's sleep behavior is.

Second, studies using objective sleep measurements suggest that infants' sleep is not influenced by where they sleep. Recent longitudinal studies using actigraphy demonstrated no difference in sleep quality between co-sleeping and solitary sleeping infants (Teti et al., 2016; Volkovich, Ben-Zion, Karny, Meiri, & Tikotzky, 2015). There were no differences in total duration of night waking, total duration of sleep, number of night waking lasting more than 5 minutes, and the longest sleep period without waking between co-sleeping and solitary sleeping infants at 3 and 6 months (Volkovich et al., 2015). Collectively, these results suggest that sleeping arrangements may not be a determinant of children's sleep, but there may be ethnic differences in whether mothers perceive their children's sleep behavior to be problematic. Owens (2002) suggests that, instead of arguing about the benefits or pitfalls of infant sleeping arrangements, researchers should identify populations and specific circumstances in which co-sleeping may be associated with unfavorable outcomes.

Family functioning

A family is one of the contexts in which co-sleeping may be associated with children's problematic sleep behavior. Family systems theory suggests that a family is an organized system; thus, any individual within a family is interdependent and can only be understood in a family context (Cox & Paley, 1997; Minuchin, 1974). However, there is a dearth of research on the linkage between family dynamics and sleeping arrangements, and only a few studies investigated this linkage (Geramo et al., 2007; Teti, Crosby, McDaniel, Shimizu, & Whitesell, 2015; Teti, Shimizu, Crosby, & Kim, 2016). For example, a retrospective study, using a variety of

questionnaires, examined mothers' and fathers' perspectives on children's sleeping arrangements and family life in an ethnically diverse sample of 100 mothers of 3 to 4-year-olds (60 % European American) (Germon et al., 2007). Children's sleeping arrangements were classified into four types: solitary sleep (children who slept in their own room during the first year and thereafter), early bed-sharers (children who slept in the parents' bed for part or all of the night during the first year – most of them continued this arrangement at least until the second year), early co-sleepers (children who slept either in the parents' bed or in the parents' bedroom or alternated between parents' bed and parents' room during the first year – many of them continued these arrangements at least until the second year), and reactive co-sleepers (children who slept in their own room during the first year, but began to sleep in parents' bed or room for part or all of the night thereafter). The authors found that the types of sleeping arrangements were unrelated to mothers' perception of their preschool-aged children's sleep to be problematic or to mothers' reports of spousal and co-parental relationships. However, regardless of the types of sleeping arrangements parents used, as mothers perceived greater problems in their children's sleep behavior, they reported lower marital intimacy and less support from the partner. Moreover, while mothers of reactive co-sleepers endorsed parenting beliefs for both solitary sleeping and co-sleeping (e.g., "sleeping alone is a great way to encourage their independence" and "bedsharing helps develop closeness between the parents and the child"), fathers in this group were less likely to endorse parenting beliefs for co-sleeping and less likely to report satisfaction with their role as a parent, compared to fathers in other sleeping arrangement groups. These results suggest that mothers' perception of their children's sleep behavior may spill over into the spousal and co-parental relationships, and that when there are discrepancies between parents in parenting beliefs regarding sleeping arrangements, there may be greater co-parental

conflict.

The present study

Taking a family systems perspective in research on sleeping arrangements, the contribution of Germon et al.'s study (2007) to the literature is noteworthy. However, this study had several limitations. First, it is unclear how many mothers of early bed-sharers and early co-sleepers consistently engaged in the same sleeping arrangements beyond the first year, and how many of them switched to different sleeping arrangements after the first year. Thus, although the authors reported that sleeping arrangements were unrelated to mothers' perception of their children's sleep behavior, it is uncertain whether mothers' perception of their children's sleep behavior was unrelated to the sleeping arrangements parents used *for their preschool-aged children*, or unrelated to the sleeping arrangements parents used *during the first year*. Second, their analyses did not fully address intra-parental discrepancies in parenting beliefs. The authors concluded that parents' discrepancies in parenting beliefs regarding sleeping arrangements may be related to unfavorable family functioning. However, their analyses simply suggested that parenting beliefs differed between mothers and fathers in the reactive co-sleeping group. It is argued that discrepancies in parenting beliefs regarding sleeping arrangements should be examined between parents *within a family*. Lastly, the authors may have underestimated the cultural influence on mothers' perception of children's sleep. For example, it is unclear how many European American mothers and ethnic minority mothers were in each of the sleeping arrangement groups. This raises the following questions: (1) Did the linkage between mothers' perception of their children's sleep behavior and the sleeping arrangements parents used for their children vary between European American and ethnic minority families?, and (2) If so, would the linkages between sleeping arrangements, parents' discrepancies in parenting beliefs, and

family functioning have differed between European American families and ethnic minority families? Given Owens' suggestions (2002) noted earlier, it is important to identify a population at risk (question 1) and specific circumstances (question 2) that infant sleeping arrangements may be associated with unfavorable outcomes.

The present study extended Germon et al.'s study (2007) in several ways. First, it focused exclusively on infancy, and examined whether patterns of sleeping arrangements parent used *during the first year* were associated with mothers' perception of their *infants'* sleep behavior, and whether these associations differed between EA and non-EA mothers. Second, it assessed inter-parental discrepancies in parenting beliefs regarding sleeping arrangements *within a family*, and examined whether the linkage between inter-parental discrepancies in parenting beliefs about sleeping arrangements and family functioning (coparenting quality) differ between families in which parents co-slept with their infants beyond 6 months of infant age and families in which infants slept in a separate room from parents by 6 months. Taking the influence of culture into account, the present study also examined whether these linkages between inter-parental discrepancies, coparenting quality, and sleeping arrangements differed between EA and ethnic minority families.

Hypotheses

The following hypotheses are addressed:

Hypothesis 1. EA mothers who co-slept with their infants beyond 6 months would be more likely than EA mothers whose infants slept in a separate room by 6 months to report infants' night wakings and difficulties in putting infants to sleep at bedtime, and to perceive infants' sleep behavior to be problematic. By contrast, sleeping arrangements would be less strongly related to mothers' perception of these infant sleep problems among ethnic minority

mothers.

Hypothesis 2 a. When EA co-sleeping parents endorse close parent-child relationships, but have discrepancies in endorsing close parent-child relationships with their partner, they would experience poorer quality of coparenting than EA parents of solitary sleeping infants.

Hypothesis 2 b. When ethnic minority parents of solitary sleeping infants endorse child independence but have discrepancies in endorsing child independence with their partner, they would experience poorer quality of coparenting than ethnic minority parents who co-slept with their infants.

With Hypothesis 2 a and 2 b, I expected that the spill-over effects of inter-parental discrepancies in parenting beliefs about infant sleeping arrangements on coparenting quality would be stronger when parents used the sleeping arrangement that was dissonant with their cultural norms than when parents used the sleeping arrangement that was consonant with their cultural norms.

Methods

Participants

Data were drawn from a longitudinal study of parenting and infant sleep across the infants' first two years of life (SIESTA: Study of Infants' Emergent Sleep Trajectories) (R01 HD052809). A coordinator recruited the mothers in local hospitals in central Pennsylvania within 2 days after delivery. Families were home-visited, and both mothers and fathers were asked to complete a variety of questionnaires pertaining to demographic information, infant sleep arrangements, and coparenting quality at 1, 3, 6, 9, 12, 18, and 24 months of infant age. The present study focused on data collected across the infants first year, from 1 to 12 months of age.

One hundred sixty seven infants (47% male) were originally recruited. Thirty seven

percent of the infants were firstborn. Mothers' average age was 29.4 years old ($SD = 5.3$), ranging from 18 to 43 years old. The sample consisted of European American (EA) (84%), African-American (3%), Asian-American (4%), Latino (5%), and other ethnicity (4%). Eighty-seven percent of mothers completed post-secondary education. Median yearly family income was \$65,000 ($SD = \$47,000$), ranging from \$9,500 to \$300,000. Of the 167 families, 18 withdrew from the study between 1 and 12 months of infant age. There were no differences in income, number of children in the home, marital status, maternal age, education, or employment between the families who dropped from the study and the originally recruited sample. No differences were also found between the dropouts and the original sample in marital quality, coparenting relationships, or sleeping arrangements parents used when their infants were 1 month of age. Throughout the first year of infant age, 74 % of mothers ($n = 124$) were married and living with their husbands, or living with a partner who was a father-figure for the infant. Thus, in the present study, the data for these 124 families (EA families [89%: $n = 110$] and ethnic minority families [11%: $n = 14$], based on mothers' ethnicity) at 1, 3, 6, 9, and 12 months of infant age were analyzed.

Measures

Mothers' perception of their infant's sleep behavior

Mothers' perception of difficulty in putting their infant to sleep (*"Overall, how much of a problem was it for you to put your baby to sleep at bedtime?"*) and the extent to which mothers perceived their infant's night waking to be problematic (*"How much of a problem for you was your baby's night wakings?"*) were assessed daily across seven consecutive days at each time point by phone interviewing mothers about their infant's sleep quality during the previous night (5-point scale, ranging from "not at all a problem" to "definitely a problem," with 0 indicating

“My child does not awake at night”). Frequency of infant night waking during the previous night (“*How many times did your infant wake up last night after s/he fell asleep?*”) was assessed across seven consecutive days at each time point, using a mother-reported sleep diary (adapted from Burnham, Goodlin-Jones, Gaylor, & Anders, 2002). The scores on difficulty in putting infant to sleep, infant’s problematic night waking, and the frequency of infant’s night waking were summed across the seven nights at each time point.

Infant sleeping arrangements and inter-parental discrepancy in parenting beliefs about infant sleeping arrangements

Mothers’ and fathers’ reasons to choose the infant sleeping arrangement were assessed, using the Sleep Practice Questionnaire (SPQ; Keller & Goldberg, 2004). The SPQ contained 62 items asking about infant sleeping arrangements and reasons for the infant sleeping arrangement parents chose to use.

The single SPQ item asking an infant’s sleeping location, “*Where does your baby usually sleep at night?*” was utilized to determine the infant sleeping arrangement that participants used at 1, 3, 6, 9, and 12 months of infant age. At each age point, data were dummy coded into two categories: solitary sleeping (sleeping in a separate room from parents all night) or co-sleeping (sleeping in parents’ bed or parents’ room part of the night or all night). To determine the patterns of infant sleeping arrangements during the first year, the dichotomized data were aggregated across all five time points to create five sleeping arrangement categories: Consistent Solitary Sleep (CS: infant slept in a separate room all night from 1 through 12 months), Early Transit (ET: switched to solitary sleep arrangement by 3 or 6 months), Late Transit (LT: switched to solitary sleep arrangement by 9 or 12 months), Consistent Co-Sleeping (CC: room-sharing, bed-sharing, part-night room-sharing, or part-night bed-sharing from 1 through 12

months), and Inconsistent (I: infant sleep arrangement patterns were not consistent from 1 through 12 months). Because in the U.S., infants are typically moved to a separate room by 6 months of age (Hauck, Signore, Fein, & Raju, 2008; Teti et al., 2015), the first two categories and the remaining three categories were collapsed to create two longitudinal sleep arrangement categories: solitary sleeping by 6 months (CS and ET) and co-sleeping beyond 6 months (LT, C, and I).

The SPQ items asking the reasons for parents' choices for the infant sleeping arrangements were utilized to identify parenting beliefs about infant sleeping arrangements that parents chose to use at 1, 3, 6, 9, and 12 months of age. The single SPQ item, "*It is important for my child's independence*" (rated on 5-point scale, ranging from "not at all a reason" to "definitely a reason"), was used to assess the extent to which parents believe that the sleeping arrangements parents were using help promote their infants' independence. Three SPQ items, "It provides a sense of emotional security for my baby," "It helps me feel emotionally closer to my baby," and "I enjoy the close physical contact," were used to assess the extent to which parents believe that the sleeping arrangements parents were using help promote physical and/or emotional proximity between a parent and a child. These three items were significantly intercorrelated at each of the five time points, and these dimensions were standardized and summed to create a close parent-child relationship composite, α (mothers) = .74 to .80 and α (fathers) = .76 to .83. Further, within-family, inter-parental discrepancies in the endorsement of their child's independence and of the close parent-child relationship were computed by subtracting a father's score from a mother's score, with positive scores representing greater mother's endorsement and negative scores representing greater fathers' endorsement.

Family functioning

Coparenting is considered a triadic, family level of analysis and distinct from marital relationships that exist at a mother-father dyadic level (Schoppe, Mangelsdorf, & Frosch, 2001; McHale, & Rasmussen, 1998; McHale, Johnson, & Sinclair, 1999) because coparenting dynamics necessarily include a child (Schoppe et al., 2001). Thus, in the present study, family functioning was examined using the Coparenting Relationship Scale (CRS; Feinberg, Brown, & Kan, 2012). The CRS assesses parents' perception of how well mothers and their partners worked together as a child rearing team. The CRS contains 47-items, with each item rated on a 7-point scale (ranging from "not true of us" to "very true of us" or "never" to "very often"). The CRS taps into seven dimensions of coparenting quality with the partner: Agreement (e.g., "My partner and I have different ideas about how to raise our child"), closeness (e.g., "The stress of parenthood has caused my partner and me to grow apart"), support (e.g., "My partner asks my opinion on issues related to parenting"), endorsement of partner's parenting, (e.g., "My partner has a lot of patience with our child"), exposure to conflict (e.g., "Argue with your partner about your child, in the child's presence"), competition-undermining (e.g., "My partner tries to show that she or he is better than me at caring for our child"), and satisfaction with division of labor (e.g., "My partner does not carry his or her fair share of the parenting work." Reverse coded). Correlation analyses revealed that the scores on the Agreement dimension was unrelated to the scores on inter-parental discrepancies in endorsing child independence or in close parent-child relationships.

Adequate internal reliability and construct validity of the CRS have been demonstrated (Feinberg et al., 2012). In the present study, positive coparenting dimensions (agreement, closeness, support, endorsement, and division of labor) were significantly intercorrelated at each

of the five time points, and these dimensions were summed to create a positive coparenting composite at each time point, α (mothers' positive coparenting) = .77 to .85, and α (fathers' positive coparenting) = .71 to .81. The two dimensions of negative coparenting (exposure to conflict and competition-undermining) were also significantly intercorrelated at each of the five time points, and these two dimensions were summed to create a negative coparenting composite at each time point, α (mothers' negative coparenting) = .61 to .72, and α (fathers' negative coparenting) = .60 to .67.

Statistical analysis strategy

Preliminary analysis

A propensity score method (PSM) was performed to ensure that there were no confounds associated with mothers' ethnicity and family functioning between EA families and ethnic minority families, and thus any results that differ between EA families and ethnic minority families are due to the mothers' ethnicity. The PSM is a statistical approach for drawing causal inference from observational data by assessing a balance of confounders, which may result from using a non-randomized design, between groups (Austin, 2011; Heinze & Juni, 2011; Thoemmes & Kim, 2011). An individual propensity score is a participant's probability to be in a target group, conditional on potential confounding variables. The PSM examines whether the distribution of the propensity scores is similar across groups; if so, the confounders will be considered "balanced" (Austin, 2011; Heinze & Juni, 2011; Thoemmes & Kim, 2011). That is, when confounders are balanced, it can be assumed that the participants are identical, or at least comparable, on background characteristics (i.e., confounders) and only differ in their actual group status (Thoemmes & Kim, 2011). A detailed discussion of the PSM is beyond the scope of this paper, and such discussion can be found elsewhere (e.g., Austin, 2011; Heinze & Juni,

2011; Thoemmes & Kim, 2011).

All confounders that are included in the PSM should be theoretically related to selection into a target group and/or to the outcome variables (Leyrat, Caille, Donnere, & Giraudeau, 2012). Past work demonstrated that compared to EAs, ethnic minorities were less likely to have a bachelor degree and more likely to have a lower household income and greater numbers of children in the household (Bayer, McMillan, & Rueben, 2004; Kirby, Taliaferro, & Zuvekas, 2006; US Census Bureau, 2016). As for the variables related to family functioning, Belsky (1984) identified three determinants of individual differences in parenting functioning: the parent's contribution (disturbance in parental psychological functioning) the child's contribution (child temperament), and contextual sources of stress and support (marital relationships and social support). In line with Belsky's model (1984), parents' depression and anxiety (Coley & Hernandez, 2006; Hughes, Gordon, & Gaertner, 2004), a child's difficult temperament (Coley & Hernandez, 2006; Lindsay, Caldera, & Colwell, 2005), poorer marital relationship/adjustment (Coley & Hernandez, 2006; Hughes et al., 2004; Lee & Doherty, 2007), and lack of social support (Lindsay et al., 2005) appeared to be negatively associated with paternal involvement in parenting, parenting alliance, and/or coparenting relationship. Further, parents' education levels, household income, and the number of children in the household were associated with both mothers' ethnicity and unfavorable family functioning (Bayer et al., 2004; Coley & Hernandez, 2006; Kirby et al., 2006; Stright & Bales, 2003). Thus, a total of 17 potential variables were included in the PSM: mothers' and fathers' educational levels (having a bachelor degree or not), household annual income, the number of children in the household, a child's temperament (Surgency/Extraversion, Negative Affectivity, and Orienting/Regulation), mothers' and fathers' depressive and anxiety symptoms, mothers' and fathers' perceptions of marital adjustment, and

mothers' and fathers' perceptions of general social support and of support from families and close-friends.

All confounder variables were measured at recruitment, except children's temperament. In the present study, children's temperament was first assessed when they were 3 months old, using the Infant Behavior Questionnaire–Revised (IBQ-R; Rothbart & Gartstein, 2000). Thus, children's temperament at 3 months of age was included in the PSM analysis. The IBQ-R is a 191-item measure of infant temperament (an 8-point scale, ranging from “never engages in the behavior” to “always engages in the behavior”). Three higher-order factors of Surgency/Extraversion, Negative Affectivity, and Orienting/Regulation can be obtained from these measures (see Gartstein & Rothbart, 2003). Internal consistency of Surgency/Extraversion (subscales of approach, vocal reactivity, high intensity pleasure, smiling and laughter, activity level, and perceptual sensitivity), Negative Affectivity (subscales of sadness, distress to limitations, fear, and falling reactivity), and Orienting/Regulation (subscales of low intensity pleasure, cuddliness, duration of orienting, and soothability) were acceptable, α (Surgency/Extraversion) = .83, α (Negative Affectivity) = .76, and α (Orienting/Regulation) = .78.

Parents' depressive and anxiety symptoms were assessed using the depression and anxiety subscales of the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1999). The depression subscale contained 13 items (α = .90 for mothers, and .88 for fathers) and the anxiety subscale contained 10 items (α = .86 for mothers, and .84 for fathers), both subscales rated on a 5-point scale (ranging from “not at all” to “extremely”). The total score was computed by summing the score on each item.

Parents' perceptions of marital adjustment were assessed using the Locke-Wallace

Marital Adjustment Test (MAT; Locke & Wallace, 1959) with four additional items (religious matters, aims, goals, and things believed to be important, making major decisions, and household tasks) incorporated from Dyadic Adjustment Scale (DAS; Spanier, 1976). Internal consistency of marital adjustment was adequate, $\alpha = .80$ for mothers and $.71$ for fathers.

Parents' perceptions of levels of support from families and close-friends and of general social support were assessed using the Interview Schedule for Social Interaction (ISSIQ; Henderson, Byrne, & Duncan-Jones, 1981). The availability of social integration subscale contains 14 items ($\alpha = .79$ for mothers and $.78$ for fathers), which assess "general support," the degree to which one feels there are individuals to turn to for support in one's environment. The availability of attachment figures subscale contains 8 items ($\alpha = .81$ for mothers and $.75$ for fathers), which assess "support from families and close-friends," number of close relationships one has.

The PSM was performed using inverse probability of treatment weighting (IPTW; Rosenbaum, 1987) in SAS 9.4. The IPTW is similar to survey sampling weights and used to up-weight the propensity scores of participants who are underrepresented and down-weight the propensity scores of those who are overrepresented in a treatment/target group (Austin, 2011). In the present study, a treatment/target group refers to families where mothers are not Caucasians, which were classified as non-EA/ethnic minority families. Because a propensity score (ps) was a probability to be non-EA families, non-EA families were given a weight of $1/ps$, whereas EA families were given $1/(1-ps)$. More technical details of IPTW can be found in Hirano and Imbens (2001) and Hirano, Imbens, and Ridder (2003). If standardized mean differences in all the potential confounding variables between EA families and non-EA families fall below $.25$, then the distribution of confounders across groups will be considered to be

balanced (Kost & Lindberg, 2015; Ho, Imai, King, & Stuart, 2007; Stuart, 2010). The balanced confounders indicate that there are no confounds associated with mothers' ethnicity and family functioning between EA families and non-EA families, and any results that differ between EA families and non-EA families is due to mothers' ethnicity.

Primary analysis

After ensuring that confounds were balanced (i.e., there was no statistical difference in the distribution of confounds) between EA and ethnic minority families, all hypotheses were tested using a multilevel modeling separately for mothers and fathers (SAS 9.4, Proc Mixed). The model testing Hypotheses 2a and 2b included mother-father discrepancies in endorsement of child independence or of close parent-child relationships as a predictor and positive or negative coparenting as an outcome. Thus, there were 4 basic patterns of analyses: (1) analysis using mother-father discrepancies in endorsement of child independence and positive coparenting, (2) using mother-father discrepancy in endorsement of child independence and negative coparenting, (3) using mother-father discrepancy in endorsement of close parent-child relationships and positive coparenting, and (4) using mother-father discrepancy in endorsement of close parent-child relationships and negative coparenting. These 4 patterns of analyses were performed separately for mothers and fathers. All analyses used maximum likelihood estimation to account for missing data in the dependent variables. The present study tested two models: (1) Model 1: Main effects of sleeping arrangements and ethnicity – the model assessed differences in an outcome using infant sleeping arrangements and ethnicity as level-2 predictors, and (2) Model 2: Effects of sleeping arrangements*ethnicity – the model assessed whether differences in an outcome by sleeping arrangements depend on families' ethnicity, using contrasts as level-2 predictors. Then, the results of Model 1 and Model 2 were compared.

To test Hypothesis 1, the following statistical strategies were utilized. First, an unconditional means model was performed. An intraclass correlation coefficient (ICC) was determined to evaluate the relative magnitude of within-person and between-person variance components. Next, an unconditional growth model was performed to examine change in the level of coparenting relationships over time. To interpret the intercept meaningfully, infant age was centered at 1 month. Lastly, level-2 predictors were added to the model one at a time. Non-significant parameters were removed at each step as needed. The fit of each model was examined using deviance-based tests, and a final best-fitting model was determined.

Model 1 for Hypothesis 1

Level-2 predictors, patterns of infant sleeping arrangements during the first year (Co-Sleep: 0 = solitary sleep by 6 months, 1 = co-sleeping beyond 6 months) and families' ethnicity (0 = non-EA/ethnic minority, 1 = EA), were added to the model, and the differences in the level of mothers perception of their infant sleep behavior by patterns of sleeping arrangements during the first year and by ethnicity were examined.

The equation for Model 1 is:

$$\text{Level 1: InfantSleepBehavior}_{ij} = \pi_{0i} + \pi_{1i} (\text{Infant Age}_{ij} - 1) + \epsilon_{ij}$$

$$\text{Level 2: } \pi_{0i} = \gamma_{00} + \gamma_{01} \text{Co-sleep}_i + \gamma_{02} \text{EA}_i + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11} \text{Co-sleep}_i + \gamma_{12} \text{EA}_i + \zeta_{1i}$$

$$\begin{aligned} \text{Composite model: InfantSleepBehavior}_{ij} = & \gamma_{00} + \gamma_{01} \text{Cosleep}_i + \gamma_{02} \text{EA}_i + \gamma_{10} (\text{Infant Age}_{ij} - \\ & 1) + \gamma_{11} (\text{Infant Age}_{ij} - 1) * \text{Co-sleep}_i + \gamma_{12} (\text{Infant Age}_{ij} - 1) * \text{EA}_i + \zeta_{0i} + \zeta_{1i} (\text{Infant Age}_{ij} - 1) \\ & + \epsilon_{ij}, \end{aligned}$$

where γ_{00} is the mean score on infant sleep behavior for ethnic minority mothers who moved their infants to solitary sleep by 6 months; γ_{01} is the difference in a score on infant sleep behavior

between mothers who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months, controlling for the effect of ethnicity; γ_{02} is the difference in a score on infant sleep between ethnic minority families and EA families, controlling for the effects of sleeping arrangements; γ_{10} is rate of change for ethnic minority mothers who co-slept with their infants beyond 6 months; γ_{11} is the difference in rate of change between mothers who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months, controlling for the effect of ethnicity; and γ_{12} is the difference in rate of change between ethnic minority families and EA families, controlling for the effects of sleeping arrangements.

Model 2 for Hypothesis 1

For Model 2, contrasts were created to test interactions between infant sleeping arrangements and ethnicity as follows (See Table 1-1):

Table 1-1. *Contrasts used in multilevel models*

	Contrast 1 (C1)	Contrast 2 (C2)
EA/SS	-1	0
EA/CS	1	0
Non-EA/SS	0	-1
Non-EA/CS	0	1

A positive coefficient of C1 or C2 indicated that parents who co-slept with their infants beyond 6 months were more likely than those who moved their infants to solitary sleep by 6 months to report their infants' poor sleep behavior. A negative coefficient of C1 or C2 indicated that parents who co-slept with their infants beyond 6 months were less likely than those who moved their infants to solitary sleep by 6 months to report their infants' poor sleep. The equation for Model 2 is:

$$\text{Level 1: InfantSleepBehavior}_{ij} = \pi_{0i} + \pi_{1i} (\text{Infant Age}_{ij} - 1) + \varepsilon_{ij}$$

$$\text{Level 2: } \pi_{0i} = \gamma_{00} + \gamma_{01}C1_i + \gamma_{02}C2_i + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}C1_i + \gamma_{12}C2_i + \zeta_{1i}$$

$$\text{Composite model: InfantSleepBehavior}_{ij} = \gamma_{00} + \gamma_{01}C1_i + \gamma_{02}C2_i + \gamma_{10} (\text{Infant Age}_{ij} - 1) + \gamma_{11} (\text{Infant Age}_{ij} - 1)*C1_i + \gamma_{12} (\text{Infant Age}_{ij} - 1)*C2_i + \zeta_{0i} + \zeta_{1i} (\text{Infant Age}_{ij} - 1) + \epsilon_{ij},$$

where γ_{00} is the grand mean in the score on mothers' perception of infant sleep behavior; γ_{01} is the difference in a score on mothers' perception of infant sleep behavior between EA mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months, controlling for the effects for ethnic minority mothers (C2); γ_{02} is the difference in a score on mothers' perception of infant sleep behavior between ethnic minority mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months, controlling for the effects for EA families (C1); γ_{10} is the grand mean in rate of change; γ_{11} is the difference in rate of change between EA mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months, controlling for the effects for ethnic minority mothers (C2); and γ_{12} is the difference in rate of change between ethnic minority mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months, controlling for the effects for EA families (C1).

To test Hypothesis 2 a and 2 b, the following statistical strategies were utilized. First, an unconditional means model was performed. Intraclass correlation coefficient (ICC) was determined to evaluate the relative magnitude of within-person and between-person variance components. Second, an unconditional growth model was performed to examine change in the level of coparenting relationships over time. Infant age was centered at 1 month. Next, adding a level-1 predictor, the effects of mother-father discrepancy in parenting beliefs on coparenting

quality was examined. Lastly, level-2 predictors were added to the model. Non-significant parameters were removed at each step as needed. The fit of each model was examined using deviance-based tests to determine a final best-fitting model.

Model 1 for Hypothesis 2 a & 2 b

Level-2 predictors, patterns of infant sleeping arrangements during the first year (Co-Sleep) and families' ethnicity (EA), were added to the model one at a time, and the differences in the level of coparenting relationships by patterns of infant sleeping arrangements during the first year and by ethnicity were examined.

The equation for Model 1 is:

$$\text{Level 1: Coparenting}_{ij} = \pi_{0i} + \pi_{1i} (\text{Infant Age}_{ij} - 1) + \pi_{2i} \text{Mother-Father Discrepancy}_{ij} + \varepsilon_{ij}$$

$$\text{Level 2: } \pi_{0i} = \gamma_{00} + \gamma_{01} \text{Co-Sleep}_i + \gamma_{02} \text{EA}_i + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11} \text{Co-Sleep}_i + \gamma_{12} \text{EA}_i + \zeta_{1i}$$

$$\pi_{2i} = \gamma_{20} + \gamma_{21} \text{Co-Sleep}_i + \gamma_{22} \text{EA}_i + \zeta_{2i}$$

$$\begin{aligned} \text{Composite model: Coparenting}_{ij} = & \gamma_{00} + \gamma_{01} \text{Co-Sleep}_i + \gamma_{02} \text{EA}_i + \gamma_{10} (\text{Infant Age}_{ij} - 1) + \\ & \gamma_{20} \text{Mother-Father Discrepancy}_{ij} + \gamma_{11} (\text{Infant Age}_{ij} - 1) * \text{Co-Sleep}_i + \gamma_{12} (\text{Infant Age}_{ij} - \\ & 1) * \text{EA}_i + \gamma_{21} \text{Mother-Father Discrepancy}_{ij} * \text{Co-Sleep}_i + \gamma_{22} \text{Mother-Father} \\ & \text{Discrepancy}_{ij} * \text{EA}_i + \zeta_{0i} + \zeta_{1i} (\text{Infant Age}_{ij} - 1) + \zeta_{2i} \text{Mother-Father Discrepancy}_{ij} + \varepsilon_{ij}, \end{aligned}$$

where γ_{02} is the difference in coparenting quality between ethnic minority families and EA families, controlling for the effects of sleeping arrangements; γ_{12} is difference in rate of change between ethnic minority families and EA families, controlling for the effects of sleeping arrangements; γ_{20} is associations between coparenting quality and mother-father discrepancies in parenting beliefs for ethnic minority families who moved their infants to solitary sleep by 6 months; γ_{21} is difference in the association between coparenting quality and mother-father

discrepancy in parenting beliefs between parents who moved their infants to solitary sleep by 6 months and parents who co-slept with their infants beyond 6 months, controlling for the effects of ethnicity; γ_{22} is the difference in the association between coparenting quality and mother-father discrepancy in parenting beliefs between ethnic minority families and EA families, controlling for the effects of sleeping arrangements.

Model 2 for Hypothesis 2 a & 2 b

The same contrasts that were used for Hypothesis 1 were utilized to test interactions between infant sleeping arrangements and ethnicity. However, for Hypothesis 2, of interest is whether differences in the association between coparenting quality and mother-father discrepancies in parenting beliefs between parents who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months vary for EA families (Mother-Father Discrepancy*C1) and for ethnic minority families (Mother-Father Discrepancy*C2).

The equation for Model 2 is:

$$\text{Level 1: Coparenting}_{ij} = \pi_{0i} + \pi_{1i} (\text{Infant Age}_{ij} - 1) + \pi_{2i} \text{Mother-Father Discrepancy}_{ij} + \varepsilon_{ij}$$

$$\text{Level 2: } \pi_{0i} = \gamma_{00} + \gamma_{01}C1_i + \gamma_{02}C2_i + \zeta_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}C1_i + \gamma_{12}C2_i + \zeta_{1i}$$

$$\pi_{2i} = \gamma_{20} + \gamma_{21}C1_i + \gamma_{22}C2_i + \zeta_{2i}$$

$$\begin{aligned} \text{Composite model: Coparenting}_{ij} = & \gamma_{00} + \gamma_{01}C1_i + \gamma_{02}C2_i + \gamma_{10} (\text{Infant Age}_{ij} - 1) + \\ & \gamma_{20}\text{Mother-Father Discrepancy}_{ij} + \gamma_{11} (\text{Infant Age}_{ij} - 1)*C1_i + \gamma_{12} (\text{Infant Age}_{ij} - 1)*C2_i + \\ & \gamma_{21}\text{Mother-Father Discrepancy}_{ij} * C1_i + \gamma_{22}\text{Mother-Father Discrepancy}_{ij} *C2_i + \zeta_{0i} + \zeta_{1i} \\ & (\text{Infant Age}_{ij} - 1) + \zeta_{2i} \text{Mother-Father Discrepancy}_{ij} + \varepsilon_{ij}, \end{aligned}$$

Where γ_{20} is the association between coparenting quality and mother-father discrepancy in parenting beliefs; γ_{21} is the difference in the association between coparenting quality and mother-

father discrepancy in parenting beliefs between parents who moved their infants to solitary sleep by 6 months and parents who co-slept with their infants beyond 6 months among EA families, controlling for the effects for ethnic minority families (C2), γ_{22} is the difference in the association between coparenting quality and mother-father discrepancy in parenting beliefs between parents who moved their infants to solitary sleep by 6 months and parents who co-slept with their infants beyond 6 months among ethnic minority families, controlling for the effects for EA families (C1). Of interest is whether γ_{21} or γ_{22} reaches a statistical significance.

Results

Preliminary analyses

Propensity score analysis

Table 1-2 presents the results of the PSM. As can be seen in the table, the standardized mean differences in all of the 17 potential confounding variables between ethnic minority and EA families fell below .25. That is, the distribution of the confounders across these two groups was balanced. This indicated that there were no confounds associated with families' ethnicity and/or coparenting quality between ethnic minority families and EA families, and that any results that differed between these two group were due to families' ethnicity.

Table 1-2. *Propensity score analysis results*

Variable	Non-European American		European American		STD Difference
	<i>M</i>	<i>STD</i>	<i>M</i>	<i>STD</i>	
Household Characteristics					
Household Income	58,584	136,451	72,770	48,376	.10
Number Of Children In Household	1.83	1.25	1.93	0.87	.07
Parents' Characteristics					
Mothers					
Bachelor's Degree	0.79	1.20	0.63	0.51	-.14
Depressive Symptoms	6.09	25.68	7.67	7.45	.06
Anxiety Symptoms	1.44	9.88	2.04	3.18	.06
Marital Relationships	140.85	44.29	138.26	20.94	-.06
Social Support	6.30	6.70	6.54	2.65	.04
Support From Families And Close-Friends	7.84	1.32	7.65	0.80	-.14
Fathers					
Bachelor's Degree	0.79	1.20	0.61	0.52	-.15
Depressive Symptoms	3.17	10.96	4.72	5.78	.14
Anxiety Symptoms	0.96	5.99	2.11	2.94	.19
Marital Relationships	131.18	31.75	139.32	19.60	.25
Social Support	6.78	4.88	7.81	2.88	.21
Support from Families and Close-Friends	6.91	2.17	7.09	1.24	.08
Child Characteristics					
Surgency	3.93	1.93	4.01	0.90	.04
Regulation)	5.17	1.30	5.05	0.58	-.08
Negative Affectivity	2.56	1.44	2.73	0.57	.11

Notes. *M* = Mean. *STD* = Standardized Mean Scores. *STD Differences* = Standardized Mean Differences. The *STD Differences* in all the potential confounding variables fall between $-.25$ and $.25$, then the distributions of confounders across groups are considered to be balanced.

Correlation analyses

Table 1-3 presents descriptive statics for mothers' perception of infant sleep behavior, and correlations between mothers' perceptions of infant sleep behavior, sleeping arrangements, and mothers' ethnicity. Correlation analyses revealed that mothers' perceptions of difficulties in

putting the infant to sleep, frequency of infant night waking, and problematic night waking were relatively stable across time, r (difficulties in putting the infant to sleep) = .30 to .43, $p < .01$, r (problematic infant night waking) = .49 to .57, $p < .001$, and r (frequency of infant night waking) = .51 to .59, $p < .001$. Mothers who co-slept with their infants beyond 6 months were more likely than mothers whose infant slept in a separate room to report difficulties in putting the infant to sleep at 6 and 12 months of infant age, $p < .01$, notice their infants' night waking at 6, 9, and 12 months, $p < .05$, and perceive their infant's night waking to be problematic at 3, 6, and 9 months, $p < .05$. There were no differences in mothers' perceptions of difficulties in putting the infant to sleep, frequency of infant night waking, and problematic night waking between ethnic minority mothers and EA mothers at all the time points.

The results of correlation analyses between parents' perceptions of positive coparenting, mother-father discrepancies in endorsing child independence, mother-father discrepancies in endorsing close parent-child relationships, sleeping arrangements, and ethnicity are presented in Table 1-4. Mothers' and fathers' perceptions of positive coparenting quality were stable over time, r (mothers) = .76 to .87, $p < .001$, and r (fathers) = .64 to .82, $p < .001$. Neither mother-father discrepancies in endorsement of child independence or of close parent-child relationships were associated with parents' perceptions of positive coparenting quality at each time point. Mothers who co-slept with their infants were less likely than mothers who moved their infant to solitary sleep by 6 months to report positive coparenting at 1 months, but sleeping arrangements were unrelated to fathers' perception of positive coparenting quality. Further, EA families were more likely than ethnic minority families to report positive coparenting quality, with EA mothers reporting greater positive coparenting quality at 1 and 12 months and EA fathers reporting greater positive coparenting at 12 months, $ps < .05$.

Table 1-5 presents the results of correlation analyses between parents' perceptions of negative coparenting, mother-father discrepancies in endorsing child independence, mother-father discrepancies in endorsing close parent-child relationships, sleeping arrangements, and ethnicity. Similar to positive coparenting, mothers' and fathers' perceptions of negative coparenting quality were stable over time, r (mothers) = .66 to .78, $p < .001$, and r (fathers) = .71 to .87, $p < .001$. Neither mother-father discrepancies in endorsement of child independence or of close parent-child relationships were associated with mothers' perception of negative coparenting quality at each time point. However, mother-father discrepancies in endorsement of close parent-child relationships were negatively associated with fathers' perception of negative coparenting, such that when mothers were more likely than fathers to endorse parent-child relationships, fathers' perception of negative coparenting decreased, $p < .05$. Further, a significant correlation between mother-reported negative coparenting at 9 months and sleeping arrangements indicated that mothers who co-slept with their infant beyond 6 months were more likely than mothers who used a solitary sleeping arrangement by 6 months to report negative coparenting at 9 months, $p < .05$. However, sleeping arrangements were unrelated to fathers' perception of negative coparenting. Moreover, families' ethnicity was unrelated to either mothers' nor fathers' perception of negative coparenting.

Table 1-3. *Descriptive statistics for mothers' perception of infant sleep behavior and correlations between mothers' perception of infant sleep behavior, sleeping arrangements, and ethnicity*

Difficulty in putting infant to sleep (Difficult BT)

			<i>Correlations</i>						
	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1 Difficult BT 1 month	12.41	5.60	1.00						
2 Difficult BT 3 months	9.75	4.31	0.40***	1.00					
3 Difficult BT 6 months	9.14	3.61	0.18*	0.41***	1.00				
4 Difficult BT 9 months	8.81	3.67	0.26**	0.41***	0.43***	1.00			
5 Difficult BT 12 months	8.49	3.36	0.08	0.20*	0.31***	0.30***	1.00		
6 Co-Sleep			0.01	0.16	0.28**	0.14	0.23**	1.00	
7 Ethnicity			-0.04	0.00	-0.10	-0.06	-0.05	-0.13	1.00

Frequency of infant night waking (Frequency of NW)

			<i>Correlations</i>						
	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1 Frequency of NW 1 month	15.12	6.67	1.00						
2 Frequency of NW 3 months	9.81	6.57	0.51***	1.00					
3 Frequency of NW 6 months	9.58	7.28	0.38***	0.59***	1.00				
4 Frequency of NW 9 months	7.63	6.86	0.27**	0.40***	0.56***	1.00			
5 Frequency of NW 12 months	5.84	6.69	0.17	0.18*	0.45***	0.58***	1.00		
6 Co-Sleep			0.13	0.14	0.22**	0.20*	0.25**	1.00	
7 Ethnicity			-0.05	-0.02	-0.15	-0.16	0.03	-0.13	1.00

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. Co-Sleep (Sleeping Arrangements): 0 = Solitary Sleep by 6 months, 1 = Co-Sleep beyond 6 months.

Ethnicity: 0 = Ethnic Minority, 1 = European American (EA).

Table 1-3. *Continued**Problematic night waking (Problematic NW)*

	<i>M</i>	<i>SD</i>	<i>Correlations</i>							
			1	2	3	4	5	6	7	
1 Problematic NW 1 month	14.29	5.73	1.00							
2 Problematic NW 3 months	10.38	6.61	0.50***	1.00						
3 Problematic NW 6 months	9.95	7.38	0.53***	0.57***	1.00					
4 Problematic NW 9 months	8.47	6.73	0.22*	0.33***	0.49***	1.00				
5 Problematic NW 12 months	7.29	6.57	0.18*	0.19*	0.39***	0.53***	1.00			
6 Co-Sleep			0.03	0.19*	0.19*	0.26**	0.15	1.00		
7 Ethnicity			0.14	0.02	-0.15	-0.08	0.06	-0.13	1.00	

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. Co-Sleep (Sleeping Arrangements): 0 = Solitary Sleep by 6 months, 1 = Co-Sleep beyond 6 months. Ethnicity: 0 = Ethnic Minority, 1 = European American (EA).

Table 1-4. Results of correlations between parents' perception of positive coparenting quality, mother-father discrepancies in endorsing child independence, mother-father discrepancies in endorsing close parent-child relationships, sleeping arrangements, and ethnicity

	<i>M</i>	<i>SD</i>	<i>Correlations</i>				
			Pos Cop				
			1 mo.	3 mo.	6 mo.	9 mo.	12 mo.
Mothers							
Pos Cop 1	145.56	18.83	1.00				
Pos Cop 3	145.15	17.28	0.76***	1.00			
Pos Cop 6	145.82	17.99	0.72***	0.79***	1.00		
Pos Cop 9	142.28	21.90	0.74***	0.82***	0.87***	1.00	
Pos Cop 12	144.64	19.34	0.76***	0.83***	0.80***	0.84***	1.00
Independence 1	0.06	1.69	0.11	0.16	0.13	0.21*	0.16
Independence 3	0.13	1.76	0.02	0.06	0.02	0.09	0.05
Independence 6	-0.01	1.76	-0.16	0.04	0.02	0.04	0.03
Independence 9	-0.16	1.74	-0.17	-0.13	-0.16	-0.11	-0.07
Independence 12	-0.10	1.66	0.05	0.05	0.07	0.06	-0.01
P-C Relation 1	-0.08	2.94	0.03	-0.03	-0.01	-0.01	-0.03
P-C Relation 3	-0.04	2.72	-0.16	-0.13	-0.16	-0.17	-0.15
P-C Relation 6	-0.06	2.75	0.08	0.05	0.03	0.01	-0.02
P-C Relation 9	-0.06	2.71	0.05	0.05	0.03	0.00	0.02
P-C Relation 12	-0.10	2.52	-0.06	-0.14	-0.0	-0.10	-0.08
Co-Sleep			-0.18*	-0.12	-0.15	-0.12	-0.11
Ethnicity			0.23*	0.13	0.09	0.08	0.20*
Fathers							
Pos Cop 1	150.14	13.80	1.00				
Pos Cop 3	151.87	12.44	0.64***	1.00			
Pos Cop 6	151.42	14.51	0.67***	0.66***	1.00		
Pos Cop 9	147.40	19.45	0.55***	0.60***	0.75***	1.00	
Pos Cop 12	149.75	16.24	0.50***	0.63***	0.77***	0.82***	1.00
Independence 1	0.06	1.69	0.16	0.22*	0.16	0.17	0.22*
Independence 3	0.13	1.76	0.04	0.02	-0.06	0.06	0.04
Independence 6	-0.01	1.76	0.05	0.02	0.07	0.06	0.03
Independence 9	-0.16	1.74	-0.17	-0.11	-0.16	-0.17	-0.12
Independence 12	-0.10	1.66	0.07	-0.08	-0.04	-0.03	-0.03
P-C Relation 1	-0.08	2.94	0.02	-0.04	-0.08	-0.07	-0.01
P-C Relation 3	-0.04	2.72	-0.17	-0.11	-0.14	-0.07	0.03
P-C Relation 6	-0.06	2.75	0.01	0.00	-0.02	-0.01	0.07
P-C Relation 9	-0.06	2.71	0.07	0.07	-0.02	-0.08	0.00
P-C Relation 12	-0.10	2.52	-0.06	-0.08	-0.10	-0.12	0.01
Co-Sleep			0.03	0.02	0.02	-0.05	0.04
Ethnicity			0.02	0.09	0.13	0.10	0.21*

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. Pos Cop = Positive coparenting quality. Co-Sleep (Sleeping Arrangements): 0 = Solitary Sleep by 6 months, 1 = Co-Sleep beyond 6 months. Ethnicity: 0 = Ethnic Minority, 1 = European American (EA).

Table 1-5. Results of correlations between parents' perception of negative coparenting quality, mother-father discrepancies in endorsing child independence, mother-father discrepancies in endorsing close parent-child relationships, sleeping arrangements, and ethnicity

	<i>M</i>	<i>SD</i>	<i>Correlations</i>				
			Neg Cop				
			1 mo.	3 mo.	6 mo.	9 mo.	12 mo.
Mothers							
Neg Cop 1	17.21	5.63	1.00				
Neg Cop 3	16.58	5.63	0.70***	1.00			
Neg Cop 6	16.79	5.93	0.62***	0.66***	1.00		
Neg Cop 9	16.69	5.83	0.70***	0.71***	0.75***	1.00	
Neg Cop 12	17.14	5.86	0.61***	0.67***	0.71***	0.78***	1.00
Independence 1	0.06	1.69	-0.07	-0.11	-0.15	-0.21*	-0.15
Independence 3	0.13	1.76	-0.02	0.05	0.05	-0.01	0.01
Independence 6	-0.01	1.76	0.04	0.08	-0.01	0.04	-0.02
Independence 9	-0.16	1.74	0.21*	0.18*	0.22*	0.12	0.12
Independence 12	-0.10	1.66	-0.10	-0.02	-0.02	-0.09	-0.03
P-C Relation 1	-0.08	2.94	-0.01	0.07	0.05	-0.04	0.07
P-C Relation 3	-0.04	2.72	0.14	0.17	0.15	0.12	0.16
P-C Relation 6	-0.06	2.75	0.00	0.09	-0.03	0.03	0.03
P-C Relation 9	-0.06	2.71	0.08	0.12	0.00	0.07	0.05
P-C Relation 12	-0.10	2.52	-0.01	0.16	0.01	0.03	0.15
Co-Sleep			0.11	0.14	0.08	0.23*	0.08
Ethnicity			-0.17	-0.17	-0.07	-0.17	-0.16
Fathers							
Neg Cop 1	17.80	7.10	1.00				
Neg Cop 3	16.83	6.69	0.71***	1.00			
Neg Cop 6	17.12	7.71	0.65***	0.80***	1.00		
Neg Cop 9	17.33	7.15	0.64***	0.76***	0.87***	1.00	
Neg Cop 12	17.40	7.49	0.71***	0.78***	0.87***	0.82***	1.00
Independence 1	0.06	1.69	-0.15	-0.11	-0.10	-0.09	-0.10
Independence 3	0.13	1.76	-0.03	0.01	0.03	0.00	-0.01
Independence 6	-0.01	1.76	-0.03	-0.04	-0.14	-0.13	-0.09
Independence 9	-0.16	1.74	0.15	0.08	0.05	0.11	0.06
Independence 12	-0.10	1.66	-0.09	0.01	0.00	-0.01	-0.03
P-C Relation 1	-0.08	2.94	-0.09	-0.13	-0.13	-0.07	-0.02
P-C Relation 3	-0.04	2.72	0.03	-0.05	-0.09	-0.04	0.00
P-C Relation 6	-0.06	2.75	-0.14	-0.17	-0.22*	-0.15	-0.12
P-C Relation 9	-0.06	2.71	0.04	-0.02	-0.02	-0.04	0.09
P-C Relation 12	-0.10	2.52	0.01	0.10	0.08	0.08	0.08
Co-Sleep			-0.02	-0.07	-0.12	-0.04	-0.04
Ethnicity			-0.15	-0.09	-0.15	-0.13	-0.04

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. Neg Cop = Negative coparenting quality. Co-Sleep (Sleeping Arrangements): 0 = Solitary Sleep by 6 months, 1 = Co-Sleep beyond 6 months. Ethnicity: 0 = Ethnic Minority, 1 = European American (EA).

Differences in mothers' perceptions of difficulties in putting infants to sleep at bedtime, frequency of infant night waking, and problematic night waking by patterns of sleeping arrangements and by ethnicity

The first hypothesis of the present study was that EA mothers who co-sleep with their infants beyond 6 months of age would be more likely than EA mothers whose infants slept in a separate room by 6 months to report difficulties in putting the infant to sleep at bedtime and infants' night wakings, and to perceive infants' sleep behavior to be problematic, but mothers' perception of infant sleep behavior would be unrelated to sleeping arrangements among ethnic minority mothers. As noted above, Model 1 examined whether differences in mothers' perceptions of difficulties in putting the infant to sleep at bedtime, frequency of infants' night wakings, and problematic night waking differed between mothers whose infants slept in a separate room by 6 months and those who co-slept with their infants beyond 6 months and between ethnic minority mothers and EA mothers, whereas model 2 examined whether the differences in mothers' perception of these infant sleep behaviors between two patterns of sleeping arrangements depended on mothers' ethnicity. A series of multilevel modeling was performed for both Model 1 and 2, and non-significant level-2 predictors were removed from the model in the process of model selection.

Model 1: Effects of sleeping arrangements and ethnicity

Table 1-6 presents the final multilevel models to predict mothers' perceptions of difficulties in putting the infant to sleep at bedtime, frequency of infants' night wakings, and problematic night waking, using sleeping arrangements and mothers' ethnicity as a separate level-2 predictor. As can be seen in the table, there was no difference in mothers' perception of difficulty in putting the infant to sleep at bedtime by sleeping arrangements. However, mothers

who co-slept with their infants beyond 6 months were more likely than mothers who moved their infants to solitary sleep by 6 months to report greater frequency of their infant's night waking and perceive their infants' night waking to be problematic, $ps < .01$. Mothers' ethnicity was unrelated to difficulties in putting the infant to sleep at bedtime, frequency of infants' night waking, problematic night waking, after controlling for the effects of sleeping arrangements.

Table 1-6. *Final multilevel models to predict mothers' perceptions of difficulty in putting infant to sleep, infant night waking to be problematic, and frequency of infant night waking*

		Difficulty in Putting Infant to Sleep	Frequency of Infant Night Waking	Infant Problematic Night Waking
Fixed Effects				
Level 1				
Intercept	γ_{00}	11.32***	12.43***	12.15***
Infant Age -1	γ_{10}	-0.17***	-0.77**	-0.55***
Level 2				
Co-Sleep	γ_{01}		2.61**	2.32**
Ethnicity	γ_{02}			
Infant Age -1 * Co-Sleep	γ_{11}			
Infant Age -1 * Ethnicity	γ_{12}			
Random Effects				
Level 1				
Within Person	σ_{ϵ}^2	16.59***	23.50***	22.54***
Level 2				
Intercept	σ_0^2	6.77***	25.48***	22.43***
Slope	σ_1^2		0.29***	0.25***
Covariance	σ_{01}^2		-1.48**	-1.19**
Goodness-of-Fit				
Deviance		3586.7	3900.5	3859.7
AIC		3594.7	3914.5	3873.7
BIC		3606.7	3934.3	3893.4

Note. ** $p < .01$, *** $p < .001$. $N = 122$. Co-Sleep: 0 = Parents moved their infants to solitary sleep by 6 months, 1 = Parents co-slept with their infants beyond 6 months. Ethnicity: 0 = Ethnic Minority, 1 = European American (EA).

Model 2: Effects of sleeping arrangements*ethnicity

Table 1-7 presents the final multilevel models using contrasts as level-2 predictors to examine an interaction between sleeping arrangements and mothers' ethnicity. Contrast 1 (C1) represents the difference between mothers who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months among EA families, whereas Contrast 2 (C2) represents the difference between mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months among ethnic minority families. Positive coefficients of C1 or C2 indicate that mothers who co-slept with their infants beyond 6 months were more likely than mothers who moved their infants to solitary sleep by 6 months to report their infants' poor sleep behavior. Negative coefficients of C1 or C2 indicate that mothers who co-slept with their infants beyond 6 months were less likely than those who moved their infants to solitary sleep by 6 months to report their infants' poor sleep behavior.

The results of Model 1 revealed a significant main effect of sleeping arrangements on mothers' perception of infant sleep behavior, such that mothers who co-slept with their infants beyond 6 months were more likely than mothers who moved their infants to solitary sleep by 6 months to report greater frequency of their infant's night waking and perceive their infants' night waking to be problematic. However, as can be seen in Table 1-7, the differences in mothers' perceptions of frequencies of their infant night waking and problematic night waking between these two patterns of sleeping arrangements were found only among EA families, $ps < .05$. Indeed, for ethnic minority families, sleeping arrangements were unrelated to mothers' perceptions of frequencies of infant night waking and problematic night waking after controlling for the effects of sleeping arrangements among EA families. However, interestingly, ethnic minority mothers who co-slept with their infant beyond 6 months were more likely than ethnic

minority mothers who used solitary sleep by 6 months to report difficulties in putting the infant to sleep, $p < .05$.

Table 1-7. *Final multilevel models using contrasts for an interaction between sleeping arrangements and mothers' ethnicity*

		Difficulty in Putting Infant to Sleep	Frequency of Infant Night Waking	Infant Problematic Night Waking
Fixed Effects				
Level 1				
Intercept	γ_{00}	11.32***	13.69***	13.26***
Infant Age -1	γ_{10}	-0.17***	-0.72**	-0.55***
Level 2				
C1	γ_{01}		1.18**	1.03*
C2	γ_{02}	1.87*		
Infant Age -1*C1	γ_{11}			
Infant Age -1*C2	γ_{12}			
Random Effects				
Level 1				
Within Person	σ_{ε}^2	16.59***	23.49***	22.55***
Level 2				
Intercept	σ_0^2	6.37***	26.06***	22.70***
Slope	σ_1^2		0.29***	0.25***
Covariance	σ_{01}^2		-1.49**	-1.18**
Goodness-of-Fit				
Deviance		3581.8	3902.8	3861.8
AIC		3591.8	3916.8	3875.8
BIC		3605.9	3936.6	3895.5

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. C1 = Difference between EA mothers who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months. C2 = Difference between non-EA mothers who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months. A positive coefficient of C1 or C2 indicates that mothers who co-slept with their infants beyond 6 months were more likely than mothers who moved their infants to solitary sleep by 6 months to report their infants' poor sleep behavior. A negative coefficient of C1 or C2 indicates that mothers who co-slept with their infants beyond 6 months were less likely than those who moved their infants to solitary sleep by 6 months to report their infants' poor sleep.

Differences in spill-over effects of discrepancies in parenting beliefs about choices of sleeping arrangements on coparenting quality by patterns of sleeping arrangements and ethnicity

The second hypothesis of the present study was that (a) when EA co-sleeping parents endorse close parent-child relationships, but have discrepancies in endorsing close parent-child relationships with their partner, they would experience poorer quality of coparenting than EA parents of solitary sleeping infants, and (b) when ethnic minority parents of solitary sleeping infants endorse child independence but have discrepancies in endorsing child independence with their partner, they would experience poorer quality of coparenting than ethnic parents who co-slept with their infants. That is, I expected that the spill-over effects of inter-parental discrepancies in parenting beliefs about choices of sleeping arrangements would be greater when parents used the sleeping arrangement that was dissonant with their cultural norms than when parents used the sleeping arrangement that was consonant with their cultural norms. To examine these hypotheses, a series of the multilevel modeling was performed separately for mothers and fathers. Non-significant level-2 predictors were removed from the model in the process of model selection.

Mothers

Model 1: Effects of sleeping arrangements and ethnicity

The results of the final models to predict mothers' perception of positive coparenting quality are presented in Table 1-8. As can be seen in the table, for both the model including inter-parental discrepancies in endorsing child independence and the model including inter-parental discrepancies in endorsing close parent-child relationships, a main effect of ethnicity was significant, suggesting that mothers from EA families reported higher positive coparenting

quality than mothers from ethnic minority families, $ps < .05$. However, the sleeping arrangements parents used were unrelated to mothers' perception of positive coparenting quality. For the model including mother-father discrepancies in endorsement of child independence, neither a main effect of inter-parental discrepancies, an interaction between inter-parental discrepancies and sleeping arrangements, nor an interaction between inter-parental discrepancies and ethnicity was significant.

Several notable associations emerged for the model including inter-parental discrepancies in endorsement of close parent-child relationships (See Table 1-8). A main effect of mother-father discrepancies in endorsement of close parent-child relationships was significant. This indicated that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting increased, $p < .05$. Interestingly, this effect depended on sleeping arrangements parents used. A significant interaction of mother-father discrepancies in close parent-child relationships and sleeping arrangements indicated that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting decreased among families who co-slept with their infant beyond 6 months, $p < .01$.

Regarding mothers' perception of negative coparenting (See Table 1-8), neither the main effect of sleeping arrangements nor the main effects of ethnicity was significant in the model including inter-parental discrepancies in endorsing child independence or the model including inter-parental discrepancies in endorsing close parent-child relationships. For the model including mother-father discrepancies in endorsement of child independence, neither a main effect of inter-parental discrepancies, an interaction between inter-parental discrepancies and sleeping arrangements, nor an interaction between inter-parental discrepancies and ethnicity was

related to mothers' perception of negative coparenting.

However, notable associations emerged again for the model including inter-parental discrepancies in endorsement of close parent-child relationships (See Table 1-8). A main effect of mother-father discrepancies in endorsement of close parent-child relationships was significant, suggesting that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of negative coparenting quality decreased, $p < .01$. Interestingly, this effect depended on sleeping arrangements parents used as well as ethnicity. A significant interaction between mother-father discrepancy in endorsement of close parent-child relationships and sleeping arrangements indicated that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of negative coparenting quality increased among families who co-slept with their infant beyond 6 months. Similarly, a significant interaction between mother-father discrepancy in endorsement of close parent-child relationships and ethnicity suggested that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of negative coparenting quality increased among EA mothers.

Table 1-8. *Final multilevel models to predict parent's perception of coparenting quality*

		Mother				Father			
		M-F Discrepancy in		M-F Discrepancy in		M-F Discrepancy in		M-F Discrepancy in	
		Independence	P-C Relationships						
		Pos Cop	Neg Cop						
Fixed Effects									
Intercept	γ_{00}	137.22***	16.91***	136.85***	16.91***	150.93***	17.32***	151.07***	17.28***
Infant Age -1	γ_{10}	-0.15	0.00	-0.11	-0.02	-0.85**	-0.01	-0.92**	0.00
M-F Discrepancy	γ_{20}	-0.23	0.04	0.55*	-0.59**	0.12	-0.18	0.15	-0.18*
Co-Sleep	γ_{01}								
Ethnicity	γ_{02}	9.76*		10.14*		0.77*		0.82*	
Infant Age -1*Co-Sleep	γ_{11}								
Infant Age -1*Ethnicity	γ_{12}								
M-F Discrepancy*Co-Sleep	γ_{21}			-1.15**	0.64***				
M-F Discrepancy*Ethnicity	γ_{22}				0.44*				
Variance Components									
Level 1									
Within Person	σ_e^2	74.63***	8.68***	73.86***	7.78***	58.56***	10.37***	58.99***	10.20***
Level-2									
Infant Age -1	σ_0^2	223.57***	24.06***	224.73***	26.00***	119.55***	34.28***	122.03***	29.57***
	σ_1^2	0.22	0.07	0.21	0.08**	0.81***	0.06*	0.95***	0.07**
	σ_{01}^2	2.98	-0.09**	2.75	-0.27**	1.35	0.08	0.81	0.14
M-F Discrepancy	σ_{02}^2				-0.27	-0.82	-2.66***		-0.29
	σ_{12}^2				0.13*	0.94	0.33*		0.21**
	σ_{22}^2				-0.05	0.52	0.08		-0.17***
Goodness-of-fit									
Deviance		4542.2	3303.8	4514.6	3266.2	4430.5	3421.7	4413.9	3391.9
AIC		4558.2	3317.8	4532.6	3290.2	4452.5	3441.7	4429.9	3411.9
BIC		4580.7	3337.4	4557.9	3323.9	4483.3	3469.8	4452.3	3439.9

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. Independence = The sleep arrangement parents were using was important to foster the infant's independence. P-C Relationship = The sleep arrangement parents were using was important to foster close parent-child relationship. Pos Cop = Parent's perception of positive coparenting quality. Neg Cop = Parent's perception of negative coparenting quality. M-F Discrepancy = Mother's score – Father's score. Co-sleep = Patterns of infant Sleep Arrangements across the first year (0 = Parents moved their infants to solitary sleep by 6 months, 1 = Parents co-slept with their infants beyond 6 months).

Model 2: Effects of sleeping arrangements*ethnicity

Table 1-9 presents the final multilevel models using contrasts as level-2 predictors. Of interest was the differences in the spill-over effects of inter-parental discrepancies in parenting beliefs on coparenting quality between mothers who used solitary sleep by 6 months and those who co-slept with their infants beyond 6 months among ethnic minority families and among EA families (M-F Discrepancy*C1 and M-F Discrepancy*C1).

The results of Model 1 suggested that mothers from EA families reported higher positive coparenting quality than mothers from ethnic minority families, and that the sleeping arrangements parents used were unrelated to mothers' perception of positive coparenting quality. However, the results of Model 2 suggested that the results of Model 1 may be misleading.

As can be seen in Table 1-9, for both the model including inter-parental discrepancies in endorsing child independence and the model including inter-parental discrepancies in endorsing close parent-child relationships, a main effect of C1 was significant. This indicated that mothers who co-slept with their infant beyond 6 months reported lower positive coparenting quality than mothers who moved their infants to solitary sleep by 6 months among EA families. However, sleeping arrangements were unrelated to mothers' perception of positive coparenting quality among ethnic minority families.

Table 1-9. *Final multilevel models using contrasts for an interaction between sleeping arrangements and ethnicity to predict coparenting quality*

		Mother				Father			
		M-F Discrepancy in				M-F Discrepancy in			
		Independence		P-C Relationships		Independence		P-C Relationships	
		Pos Cop	Neg Cop	Pos Cop	Neg Cop	Pos Cop	Neg Cop	Pos Cop	Neg Cop
Fixed Effects									
Intercept	γ_{00}	144.67***	16.91***	144.70***	16.90***	150.94***	17.31***	151.07***	17.28***
Infant Age -1	γ_{10}	-0.15	0.00	-0.12	-0.01	-0.18	-0.01	-0.20	0.00
M-F Discrepancy	γ_{20}	-0.22	0.04	-0.09	0.12	0.14	-0.17	0.16	-0.18*
C1	γ_{01}	-3.48*		-3.46*					
C2	γ_{02}					8.30**	-4.89***	8.21**	-4.02**
Infant Age -1*C1	γ_{11}								
Infant Age -1*C2	γ_{12}								
M-F Discrepancy*C1	γ_{21}			-0.67**	0.32***				
M-F Discrepancy*C2	γ_{22}								
Variance Components									
Level 1									
Within Person	σ_{ϵ}^2	74.63***	8.68***	73.39***	7.82***	58.91***	10.39***	58.86***	10.19***
Level-2									
Infant Age -1	σ_0^2	223.54***	24.06***	227.12***	26.32***	111.23***	32.36***	114.19***	27.50***
	σ_1^2	0.22	0.07	0.23	0.07**	0.88***	0.06*	1.03***	0.07**
	σ_{01}^2	3.03	-0.09**	2.71	-0.26	1.46	0.08	0.89	0.16
M-F Discrepancy	σ_{02}^2				-0.36	-1.49	-2.87***		-0.19
	σ_{12}^2				0.14*	0.75	0.32*		0.20**
	σ_{22}^2				-0.05	0.56	0.07		-0.17***
Goodness-of-fit									
Deviance		4542.4	3303.8	4514.7	3269.7	4428.6	3411.9	4412.3	3385.0
AIC		4558.4	3317.8	4532.7	3291.7	4450.6	3433.9	4428.3	3407.0
BIC		4580.9	3337.4	4557.9	3322.6	4481.4	3464.7	4450.7	3437.8

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 122$. C1 = Difference between EA parents who moved their infants to solitary sleep by 6 months and those who co-slept with their infants beyond 6 months. C2 = Difference between non-EA parents who co-slept with their infants beyond 6 months and those who moved their infants to solitary sleep by 6 months. A positive coefficient of C1 or C2 indicates that parents who co-slept with their infants beyond 6 months reported higher positive/negative coparenting quality than those who moved their infants to solitary sleep by 6 months. A negative coefficient of C1 or C2 indicates that parents who co-slept with their infants beyond 6 months reported lower positive/negative coparenting quality than those who moved their infants to solitary sleep by 6 months.

For the model including mother-father discrepancies in endorsement of child independence, neither a main effect of inter-parental discrepancies, an interaction between inter-parental discrepancies and C1, nor an interaction between inter-parental discrepancies and C2 was significant. However, an interesting association was found for the model including inter-parental discrepancies in endorsement of close parent-child relationships. An interaction between mother-father discrepancies in endorsing close parent-child relationships and C1 was significant, suggesting that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting decreased among EA families who co-slept with their infant beyond 6 months, $p < .01$ (See Table 1-9 and Figure 1-1). However, for ethnic minority families, the effect of inter-parental discrepancies in endorsement of close parent-child relationships on positive coparenting did not differ between mothers who used solitary sleep by 6 months and those who co-slept with their infant beyond 6 months.

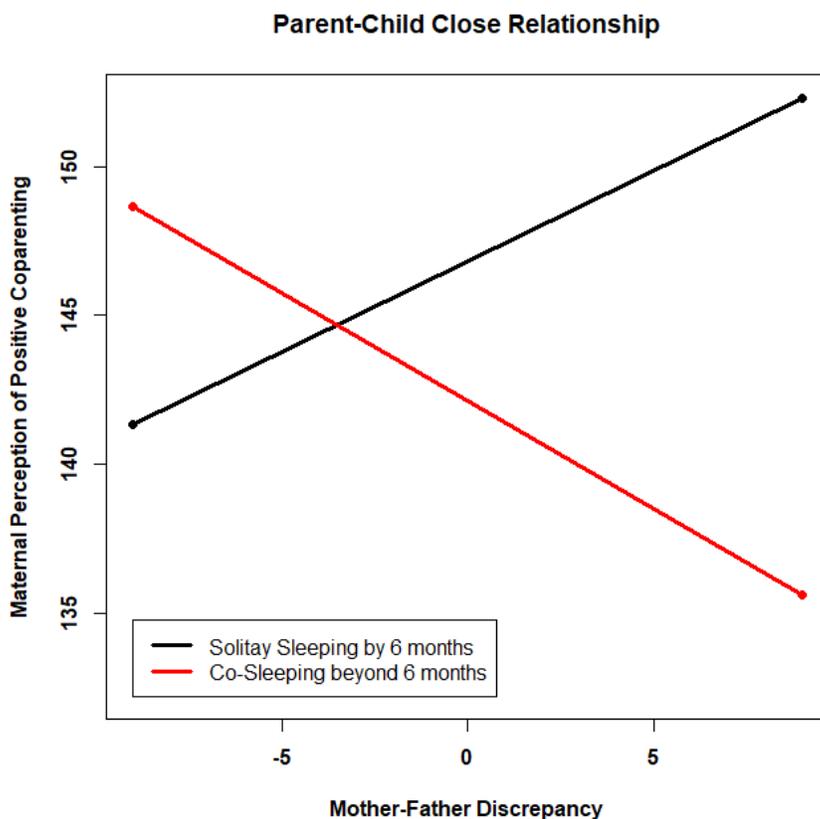


Figure 1-1. *The effect of mother-father discrepancies in endorsement of close parent-child relationships on mothers' perception of positive coparenting among EA families. Multilevel models using EA families' data suggested that the slopes for both patterns of sleeping arrangements were significant, $p < .05$.*

With respect to mothers' perception of negative coparenting (See Table 1-9), none of the parameters was significant for the model including inter-parental discrepancies in endorsement of child independence. However, again, an association emerged for the model including inter-parental discrepancies in endorsement of close parent-child relationships. An interaction between mother-father discrepancies in endorsement of close parent-child relationships and C1 was significant, indicating that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of negative coparenting increased among EA families who co-slept with their infant beyond 6 months, $p < .001$ (See Table 1-9 and Figure 1-

2). Yet, among ethnic minority families, the effect of inter-parental discrepancies in endorsement of close parent-child relationships on mothers' perception of negative coparenting quality did not differ between mothers who used solitary sleep by 6 months and those who co-slept with their infant beyond 6 months. Together with the results for mothers' perception of positive coparenting quality, the results of Model 2 indicated that the results of Model 1, which suggested that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting decreased among families who co-slept with their infant beyond 6 months, may be oversimplified.

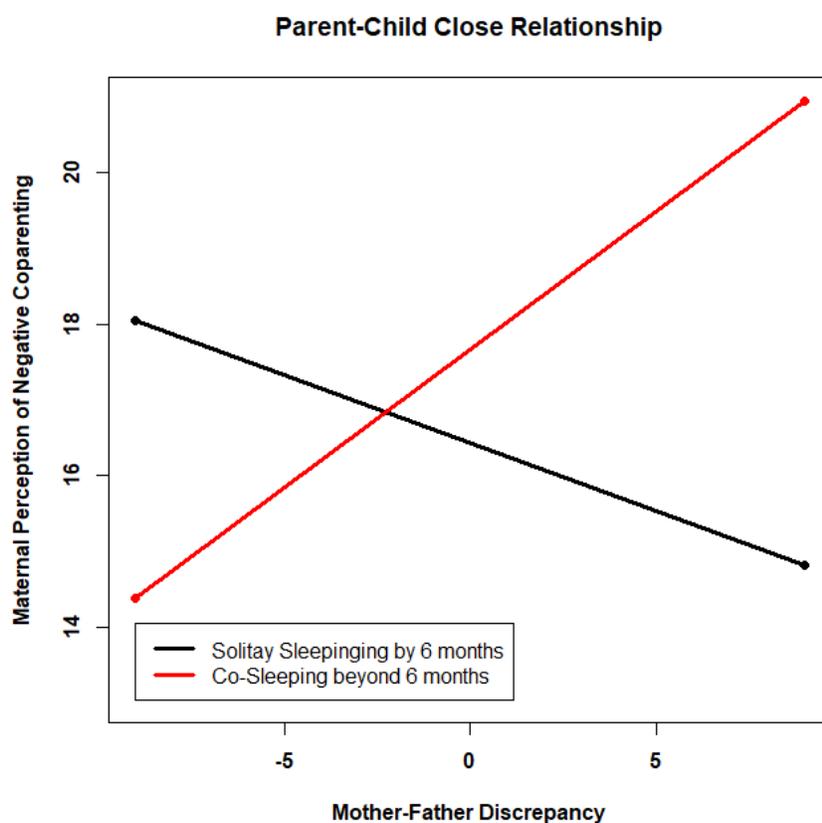


Figure 1-2. *The effect of mother-father discrepancies in endorsement of close parent-child relationships on mothers' perception of negative coparenting among EA families. Multilevel models using EA families' data suggested that the slope for Co-Sleeping beyond 6 months group was significant, $p < .01$.*

Fathers

Model 1: Effects of sleeping arrangements and ethnicity

The results of the final models to predict fathers' perception of positive coparenting quality are presented in Table 1-8. As can be seen, for both the model including inter-parental discrepancies in endorsing child independence and the model including inter-parental discrepancies in endorsing close parent-child relationships, main effects of time and ethnicity were significant. The significant time effect suggested that fathers' perception of positive coparenting decreased over time. Similar to the results for mothers' perception of positive coparenting, a significant main effect of ethnicity indicated that fathers from EA families reported higher positive coparenting quality than fathers from ethnic minority families, $p < .05$. None of other predictors was significant.

Regarding fathers' perception of negative coparenting (See Table 1-8), none of the predictors was significant for the model including mother-father discrepancies in endorsement of child independence. However, a significant main effect of mother-father discrepancies was found for the model including inter-parental discrepancies in endorsement of close parent-child relationships, such that when fathers were more likely than mothers to endorse close parent-child relationships, fathers' perception of negative coparenting quality increased, $p < .05$ (See Table 1-8).

*Model 2: Effects of sleeping arrangements*ethnicity*

Table 1-9 presents the final multilevel models using contrasts as level-2 predictors. Similar to mothers' perception of positive coparenting, the results of Model 1 for fathers suggested that fathers from EA families reported higher positive coparenting quality than fathers from ethnic minority families, and that sleeping arrangements parents used were unrelated to

fathers' perception of positive coparenting quality. However, again, the results of Model 2 indicated that the results of Model 1 may be misleading.

As can be seen in Table 1-9, a significant main effect of mother-father discrepancies in endorsing close parent-child relationships on fathers' perception of negative coparenting quality suggested that, similar to Model 1, when fathers were more likely than mothers to endorse close parent-child relationships, fathers' perception of negative coparenting quality increased, $p < .05$. However, a main effect of C 2 was significant for both the model including inter-parental discrepancies in endorsing child independence and the model including inter-parental discrepancies in endorsing close parent-child relationships. This indicated that among ethnic minority families, fathers who co-slept with their infant beyond 6 months reported higher positive coparenting quality and lower negative coparenting quality than fathers whose infants slept in a separate room by 6 months, $ps < .01$ (See Table 1-9). Fathers' perception of positive or negative coparenting quality were unrelated to sleeping arrangements parents used among EA families.

Additional analyses: Reciprocal relations between coparenting quality and co-sleeping

The results of Model 2 for mothers suggested that among EA families, mothers' who co-slept with their infants beyond 6 months reported lower positive coparenting and higher negative coparenting than mothers who moved their infants to solitarily sleep by 6 months, and that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting quality decreased and negative coparenting quality increased. This raised a question of how EA mothers' perception of coparenting quality was associated with their choices of infant sleeping arrangements across time. Is poor coparenting quality a cause of co-sleeping, or is co-sleeping a cause of poor coparenting quality? To test the reciprocal

relations between EA mothers' perception of coparenting quality and sleeping arrangements they used, cross-lagged panel models (CLPMs) were performed using the scores on mothers' perception of positive/negative coparenting quality and the sleeping arrangement parents used at each time point (AMOS 24).

Figure 1-3 and 1-4 present the CLPM models that were fit to examine reciprocal relations between mothers' perception of positive coparenting and negative coparenting, respectively. The CLPM models for mothers' perceptions of positive as well as negative coparenting were a good fit to the data, $\chi^2(24) = 22.21, p < .57, GFI = .96, NFI = .97, CFI = 1.00,$ and $RMSEA = .00$ for positive coparenting; $\chi^2(24) = 21.75, p < .59, GFI = .96, NFI = .96, CFI = 1.00,$ and $RMSEA = .00$ for negative coparenting. The models revealed that EA mothers' perception of coparenting quality at 1 month led them to bring their infants into a bedroom at 3 months. This Granger causality was found, using both positive and negative coparenting relationships ($\beta = -.25, p < .01,$ and $\beta = .22, p < .01,$ respectively). Further, mother-infant co-sleeping at 6 months resulted in EA mothers' perception of negative coparenting quality at 9 months ($\beta = .10, p \leq .05$).

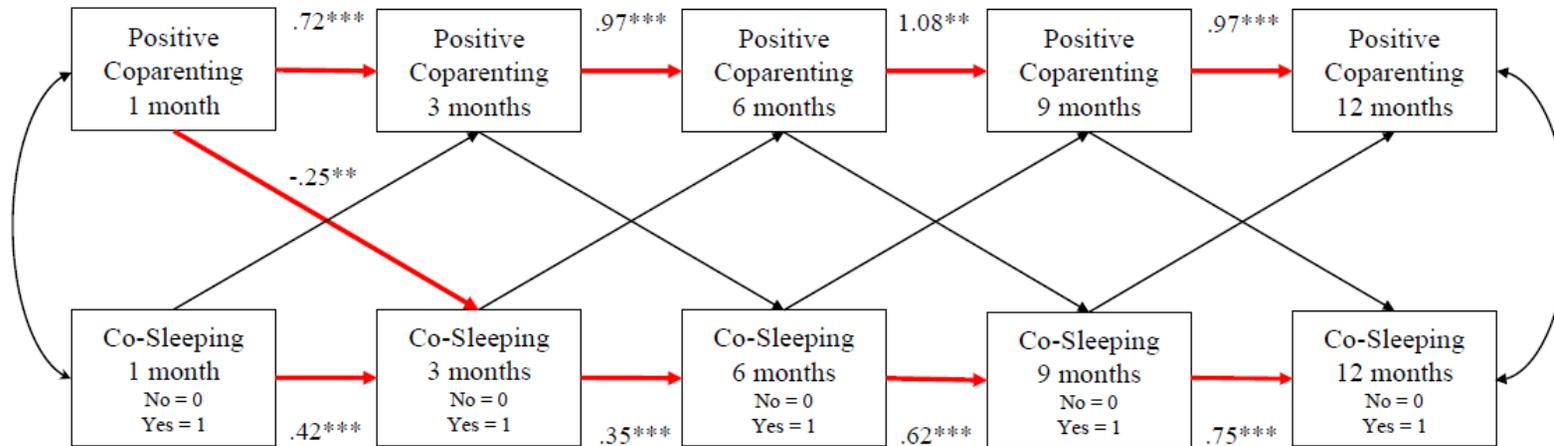


Figure 1-3. Results of the cross-lagged panel model that was fit to examine reciprocal relations between mothers' perception of positive coparenting and sleeping arrangements. Red arrows represent significant relations.

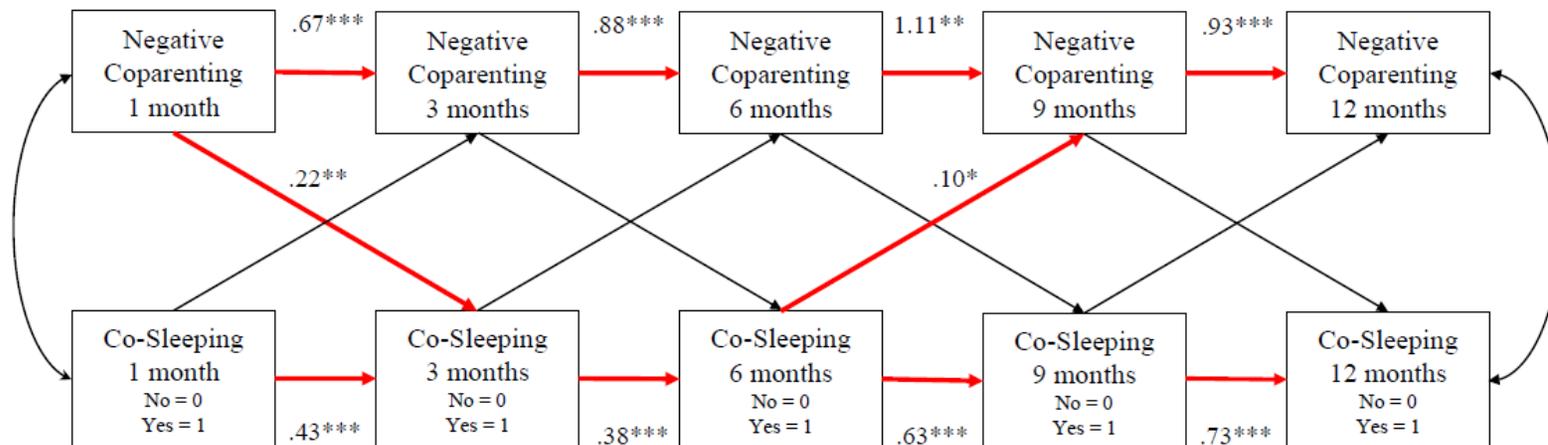


Figure 1-4. Results of the cross-lagged panel model that was fit to examine reciprocal relations between mothers' perception of negative coparenting and sleeping arrangements. Red arrows represent significant relations.

Discussion

The present study examined whether the linkage between mothers' perception of their infants' sleep behavior and infant sleeping arrangements parents used differ between ethnic minority families and European American families, and whether the effects of inter-parental discrepancies in parenting beliefs on family functioning differ between families who co-sleep with their infants and families whose infants slept in a separate room, and between ethnic minority families and European American families, during the first year of infant age. The results indicated that it was the persistently co-sleeping European American mothers who perceived greater frequencies of their infant night waking and viewed the child's night waking to be problematic, and who were at risk for unfavorable family functioning, particularly when mothers are more likely than their partner to endorse close parent-child relationships as a reason for co-sleeping with their infants.

Hypothesis 1: Differences in mothers' perceptions of difficulties in putting infants to sleep at bedtime, frequency of infant night waking, and problematic night waking by patterns of sleeping arrangements and ethnicity

It was hypothesized that mothers' perception of infant sleep problems would be higher among European American co-sleeping mothers than among European American mothers of solitary sleeping infants, but mothers' perceptions of infant sleep problems would be unrelated to sleeping arrangements among ethnic minority mothers. This hypothesis was partially supported. Multilevel models revealed that, as predicted, the differences in mothers' perceptions of frequencies of their infant night waking and problematic night waking between these two patterns of sleeping arrangements were found only among European American families. This result is consistent with past work, which suggested that among Western European mothers,

when there is a mismatch between cultural norms about how to structure infant sleeping arrangements and the sleeping arrangements parents are using, mothers are more likely to notice their child's sleep disruptions and view them as problematic than when the cultural norms match their choices of sleeping arrangements (Luikj et al., 2013).

Interestingly, ethnic minority mothers who co-slept with their infant beyond 6 months reported greater difficulties in putting the infant to sleep, but no differences were found in mothers' perceptions of frequencies of infant night waking and problematic night waking between mothers who co-slept with their infant beyond 6 months and those who used solitary sleep by 6 months among ethnic minority families. This may also support the premise that cultural values shapes parents' perceptions of infant sleep behavior (Jenni & O'Conner, 2005). Because it is a collectivistic value orientation to prioritize the need of the infants over their own needs (Markus & Kitayama, 1991; Triandis, 1995), although ethnic minority mothers who persistently co-slept with their infants experience bedtime difficulties, ethnic minority mothers in general may be more likely than European American mothers to have greater tolerance to their infants' night waking and consider it as a process of normal child development, as Lee (1992) and Latz et al. (1999) demonstrated.

Hypothesis 2: Differences in spill-over effects of discrepancies in parenting beliefs about choices of sleeping arrangements on coparenting quality by patterns of sleeping arrangements and ethnicity

Extended Germo et al.'s study (2007), which suggested that discrepancies between parents in parenting beliefs regarding sleeping arrangements may spill over into coparental conflict, it was hypothesized that the spill-over effects of inter-parental discrepancies in parenting beliefs about choices of infant sleeping arrangements would be greater when parents

used the sleeping arrangement that was dissonant with their cultural norms than when they used the sleeping arrangement that was consonant. I expected that when European American co-sleeping parents endorse close parent-child relationships but have discrepancies in endorsing close parent-child relationships with their partner, they would report poorer quality of coparenting than European American parents of solitary sleeping infants. Similarly, when ethnic minority parents of solitary sleeping infants endorse child independence but have discrepancies in endorsing child independence with their partner, they would report poorer quality of coparenting than ethnic minority parents who co-slept with their infants. This hypothesis was partially supported, exclusively for mothers.

The results of the present study revealed that the effects of mother-father discrepancies in endorsement of child independence as a reason for choosing infant sleeping arrangements on mothers' perception of positive/negative coparenting were unrelated to sleeping arrangements among ethnic minority families or among European American families. However, the differences in spill-over effects of mother-father discrepancies in endorsement of close parent-child relationships on coparenting between the two patterns of sleeping arrangements were found only among European American mothers. As expected, when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perceptions of positive coparenting decreased and negative coparenting increased among European American mothers who co-slept with their infant beyond 6 months. On the other hand, contrary to expectations, the relation between inter-parental discrepancies in close parent-child relationships and mothers' perception of coparenting were unrelated to sleeping arrangements among ethnic minority families. Taken together, it can be assumed that it may be the persistently co-sleeping European American mothers who are at risk for unfavorable family functioning, particularly when mothers are more

likely than their partner to endorse close parent-child relationships as a reason for co-sleeping with their infants.

Indeed, additional analyses revealed that European American mothers' perception of coparenting quality at 1 month led them to bring their infants into a bedroom at 3 months. This relation was found, using both positive and negative coparenting relationships. These results may suggest the "boundary problems" that family systems theory posits. Family systems theory assumes that subsystems within a family are governed by boundaries to protect differentiation of the system (Minuchin, 1974), and that, because the problems within the parent subsystem tend to extend to other parts of the family system, the parent subsystem must achieve a boundary that protects it from interference by the demands of members in other subsystems. Boundary problems arise when a parent constantly uses the child to diffuse conflicts within the parent subsystem (Minuchin, 1974). In such families, the boundary between the parent subsystem and the child becomes blurry, and the differentiation of the systems diffuses. For example, an enmeshed mother-child subsystem would exclude the father by creating a cross-generational coalition against the father. In line with this, the results of past work suggested that heightened family distress may predispose mothers to structure infant sleeping arrangements to allow them spend more time with their infants at night as a way of compensating for a lack of closeness with their partner (Teti & Crosby, 2012; Teti et al., 2015, 2016). The authors of these studies hypothesized that persistent co-sleeping throughout the infant's first year, particularly in a culture where parent-child co-sleeping beyond 6 months is not endorsed, may be a marker of heightened family stress. Indeed, the results of the present study supported their premise, such that when European American mothers perceived poor alliance with their partner, they brought their infant to their bedrooms, perhaps as a way of compensating for a lack of closeness with their

partner. This enmeshed mother-child subsystem is further evidenced by the present study's results that when European American mothers were more likely than their partner to endorse close parent-child relationships, mothers' perceptions of poor coparenting relationships increased.

The present study revealed another interesting result: ethnic minority fathers who co-slept with their infants reported higher positive coparenting and lower negative coparenting than their counterparts. That is, ethnic minority fathers in families where co-sleeping persisted beyond 6 months reported greater agreement and emotional closeness with their wives, greater appreciation of their wife's contribution to parenting, and lower incidence of exposure to conflict, competition, or undermining than ethnic minority fathers whose infants slept alone by 6 months. However, it is unclear how this squared with the null result of the differences in the effects of inter-parental discrepancies in parenting beliefs by sleeping arrangements among ethnic minority families. The role of fathers' perception of coparenting on choices of sleeping arrangements may represent an important focus for future research.

The result comparisons between two models: the effects of sleeping arrangements and ethnicity versus the effects of sleeping arrangements by ethnicity

The present study tested two models: the model assessing differences in an outcome using infant sleeping arrangements and ethnicity as level-2 predictors (Model 1), and the model assessing whether differences in an outcome by sleeping arrangements depended on families' ethnicity (Model 2). There was notable discrepancies in the results between Model 1 and Model 2.

As for mothers' perception of their infant sleep behavior, the results of Model 1 suggested that mothers who co-slept with their infants beyond 6 months were more likely than

mothers who moved their infants to solitary sleep by 6 months to report greater frequency of their infant's night waking and perceive their infants' night waking to be problematic, but mothers' ethnicity was unrelated to either frequency of infants' night wakings or problematic night waking. However, Model 2 revealed that the differences in mothers' perceptions of frequencies of their infant night waking and problematic night waking between the two patterns of sleeping arrangements were found only among EA families.

As for parents' perceptions of coparenting relationships, the results of Model 1 suggested that sleeping arrangements parents used were unrelated to mothers' perception of positive coparenting quality. However, Model 2 revealed that, indeed, European American mothers who co-slept beyond 6 months reported lower positive coparenting quality than mothers who used solitary sleep by 6 months, and sleeping arrangements were unrelated to mothers' perception of positive coparenting quality among ethnic minority families. With respect to inter-parental discrepancies in endorsing close parent-child relationships, Model 1 suggested that when mothers were more likely than fathers to endorse close parent-child relationships as a reason for choosing sleeping arrangements, mothers' perception of positive coparenting decreased and negative coparenting increased among mothers who persistently co-slept with their infants beyond 6 months. Yet, the results of Model 2 revealed that it was, indeed, persistently co-sleeping, European American mothers whose perception of positive coparenting decreased and negative coparenting increased when mothers were more likely than fathers to endorse close parent-child relationships. For ethnic minority families, sleeping arrangements were unrelated to the effects of inter-parental discrepancies in endorsement of close parent-child relationships on coparenting quality.

Together, these discrepancies between the model using infant sleeping arrangements and

ethnicity as separate predictors and the model assessing the interactions between sleeping arrangements and ethnicity suggest that the results of the former model are oversimplified and misleading. In line with this, past work that demonstrated a strong association between co-sleeping and frequencies of mother-reported infant night waking included only the sleeping arrangement variable into the model, ignoring the effects of ethnicity, in a sample where 60 to 90 % were Caucasian (Mao et al., 2004; Mindell et al., 2009; Sadeh et al., 2009). However, the studies that included an interaction between sleeping arrangements and families' ethnicity into the model (Latz et al., 1999; Lozogg et al., 1996) and the study using ethnicity-stratified analyses (Luijk et al., 2013) revealed that it was co-sleeping Caucasian parents who reported greater infant sleep disturbances than their counterparts. Co-sleeping was unrelated to mothers' perception of their infant's sleep problems among non-Caucasian parents. Thus, the results of the present study have important implications for sleep research: the effects of an interactions between sleeping arrangements and ethnicity should not be ignored and should be included in the model. Otherwise, the model may yield biased results.

Limitations and future directions

The present study has several limitations that need to be addressed. First, due to the small sample size of ethnic minority families ($n = 14$), caution should be taken in generalizing the present study's results to broader samples. Although the results of the PSM suggested that there were no differences in the distributions of confounding variables that may be associated with parents' perceptions of infant sleep behavior, family functioning, and ethnicity between ethnic minority families and European American families, and any results that differed between these two group were due to families' ethnicity, the small sample size of ethnic minority families may be a main drawback of the present study. However, given the popular notions made by pediatric

professionals, parenting educators, and sleep researchers that co-sleeping is associated with children's sleep problems and may hinder the development of their self-soothing skills (Brazelton & Sparrow, 2003; Mao et al., 2004; Mindell et al., 2009; Sadeh et al., 2009; Spock & Needlman, 2011), the present study added important insight to the literature, such that the associations among parents' perceptions of infant sleep behavior, spill-over effects of inter-parental discrepancies in parenting beliefs on family functioning, and sleeping arrangements parents use may differ between ethnic minority families and European American families, evinced by the comparisons of the results between Model 1 and Model 2. The present study made an important first step towards broader understanding of how sleeping arrangements parents chose to use impact their perceptions of the infant's sleep behavior and family functioning, and whether these associations differ between ethnic minority families, where co-sleeping is culturally endorsed, and European American families, where co-sleeping is discouraged.

Second, because the parenting belief that the sleeping arrangement parents are using is important for the child's independence was measured a single item, this measurement may not have sufficient content validity, as seen in the null results of the model using inter-parental discrepancies in endorsing child independence on both parents' perceptions of coparenting quality. Third, data were collected entirely using parent reports, and thus participant biases cannot be avoided. However, because parents' parenting beliefs and their perceptions of the infant's sleep behavior and coparenting relationships were of interest, the self-report measurements are valuable in their own right. Lastly, the results using the CLPM may not infer causation because strong causal statements can be made only by using experimental designs. However, although whether the CLPM infers causality is a controversial topic, it is often

believed that the cross-lagged regression parameters obtained with the CLPM are the most appropriate measures for studying causality in longitudinal correlational data (Hamaker, Kuiper, & Grasman, 2015). Further, it is a quite common practice to standardize the cross-lagged regression coefficients, compare their relative strength, and determine which variable has a stronger causal influence on the other (Hamaker et al., 2015).

Nonetheless, the results of the present study added important insight to literature, demonstrating that it may not be sleeping arrangements *per se* but parents' cultural heritage that are associated with their perceptions of infant sleep behavior, and that it may be not co-sleeping families but the persistently co-sleeping European American mothers who are at risk for unfavorable family dynamics, particularly when mothers are more likely than their partner to endorse close parent-child relationships as a reason for co-sleeping with their infants. When European American mothers experience a poor alliance with their partner, they co-sleep with their infants. We do not advocate one type of sleeping arrangement over another. However, as Owen (2002) suggests, instead of arguing the benefits or pitfalls of sleeping arrangements, it is crucial to identify a population and specific circumstances in which co-sleeping may be associated with unfavorable outcomes. I hope that the present study inspires more research on this topic.

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Study II

The Roles of Family Processes in Infant Sleep and Development

In the First Year

Introduction

Young children's sleep problems are a chief parental concern when visiting pediatric professionals. Indeed, 17% to 34% of infants have been found to exhibit sleep disturbances (Bayer, Hiscock, Hampton, & Wake, 2007; Martin, Hiscock, Hardy, Davey, & Wake, 2007). Research has demonstrated that infant sleep disturbances are associated with parents' reduced sleep (Dorheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009; Goyal, Gay, & Lee, 2007; Mindell, Sadeh, Kwon, & Goh, 2015), depression (Hiscock & Wake, 2001; Wake et al., 2006), and parenting stress (Thome & Skuladottir, 2005). Further, infants' disturbed sleep was shown to be associated with emotional and behavioral problems in toddlerhood (Mindell, Leichman, DuMond, & Sadeh, 2017) and preschool-years (Sadeh et al., 2015).

The association between infant sleep and parents' distress is complex. A transactional model of sleep (Sadeh & Anders, 1993) suggests the bidirectional influences among distal environmental factors, proximal parents' factors, and infant sleep. Bidirectional linkages between infants' sleep, parents' sleep, and parents' well-being have been investigated (Philbrook & Teti, 2016; Sadeh & Anders, 1993, Sadeh, Tikotzky, & Scher, 2009), yet the role of more distal environment (cultural norms and family) in infants' sleep, parents' sleep, and well-being is still an immature research area. For example, the negative consequences of co-sleeping on infants' sleep and family life have been intensively argued (For a comprehensive review, see Thoman, 2006), but empirical evidence indicates that the associations between co-sleeping, infant sleep, and family life depend on families' cultural background (Lozoff, Askew, & Wolf,

1996; Luijk et al, 2013). Indeed, family systems theory suggests that it may not be sleeping arrangements but family systems that influence parents' sleep, well-being, and infants' sleep and socio-emotional development. The present study of a European American sample examined whether family processes (changes in family functioning over time) were associated with infants' sleep, and parents' sleep and well-being in the first year of infants' life, and were also associated with infants' sleep and socio-emotional development in the second year, independent of whatever sleep arrangements parents use.

Systems perspective on child sleep and development

Children's development is influenced by surrounding environments. Several systems models have been offered for understanding ecological influences on child development. Bronfenbrenner (1986, 1995; Bronfenbrenner & Morris, 2006) proposed ecological systems theory, which views the child as developing within a complex interaction of micro- and macro-environmental systems. In a similar vein, Sameroff (1989, 2000) proposed a transactional model, which considered child development a product of transactions between the child and his or her distal and proximal environments. Both models view the child as existing within intricate ecological systems, where multiple levels of environment dynamically influence child development. These systems models (Bronfenbrenner, 1986, 1995; Bronfenbrenner & Morris, 2006; Sameroff, 1989, 2000) have been adapted to understand the ecological influences on children's sleep. For example, Sadeh and Anders (1993) proposed a transactional model of sleep, which emphasized the bidirectional influences among distal environmental factors (e.g., cultural norms, socioeconomy, and family functioning) and proximal parents' factors (e.g., well-being) on infant sleep development.

Studies using the systems models have demonstrated the strong associations between the

proximal parents' factors and young children's sleep. Persistent infants' sleep problems are associated with mothers' sleep deprivation (Dorheim et al., 2009; Goyal et al., 2007; Mindel et al., 2015), mood disturbance (Hiscock & Wake, 2002; Lam, Hiscock, & Wake, 2003), fatigue (Dennis, & Ross, 2005), and depression (Hiscock & Wake, 2002; Teti & Crosby, 2012; Wake et al., 2006). Given the transitional model of sleep (Sadeh & Anders, 1993), it can be assumed that children's sleep problems disturb parents' sleep, which may increase parents' vulnerability for negative affects, which may, in turn, undermine their well-being. The parents' distress may, in turn, undermine the quality of parenting, which may intensify children's sleep disturbances. The children's disturbed sleep may further impact parents' sleep and well-being. However, studies examining the influences of distal environments (cultural, socioeconomic, and familial factors) on parents' sleep, well-being, and infants' sleep have been limited.

Linkages between culture, sociodemographics, proximal parents' factors, and infants' sleep

Infant sleep arrangements appear to be culture-bound, ranging from having infants sleep in a separate room from parents (solitary sleep), typical in the U.S. and other Western cultures, to sleeping in the same room or bed as the parents' (co-sleeping), more typical in non-Western cultures. A recent internet-based study suggests that 86% of children under the age of three in 12 predominantly Asian countries sleep with their parents in the same room, and 65% sleep with their parents in the same bed (Mindell, Sadeh, Wiegand, How, & Goh, 2010). Parents in western countries, however, tend to have their young children sleep in a separate room. Sixty three percent of children under age 3 in Australia, Canada, New Zealand, U.K., and U.S. sleep in their own room (Mindell et al., 2010). In the first year of infants' life, U.S. parents typically refrain from co-sleeping beyond 6 months (Hauck, Signore, Fein, & Raju, 2008; Kendall-Tackett, Cong, & Hale, 2011; McCoy et al., 2004; Teti, Crosby, McDaniel, Shimizu, & Whitesell, 2015) with

70% of parents moving their infants to a separate room by 12 months (Hauck et al., 2008; Teti et al., 2015).

Past work has reported unfavorable associations between co-sleeping, sociodemographics, parent factors (sleep and well-being), and children's sleep and development. Compared to mothers whose infants sleep in a separate room, mothers who co-sleep with their infants have been found to be younger, never married, less educated, and economically disadvantaged (Lozoff, Abraham, Wolf, & Davis, 1984; McCoy et al., 2004). Moreover, co-sleeping is associated with persistent child night waking and bedtime struggles (Cortesi, Giannotti, Sebastiani, Vagnoni, & Marioni, 2008; Mindell, Meltzer, Carskadon, & Chrvn, 2009), shorter duration of maternal and infant sleep (Sadeh, Mindell, Luedtke, & Wiegand, 2009), and maternal depression (Teti et al., 2015). However, it should be noted that these linkages were found primarily among European or European American families. Studies in the U.S. reported that African American, Hispanic, and Asian mothers were 3 to 7 times more likely than European American mothers to co-sleep with their infants, regardless of their socioeconomic status (SES) (Lozoff, Askew, & Wolf, 1996). Among families who co-slept with their children, European American mothers were more likely than African American mothers to view their child's sleep behavior to be stressful, conflicting, or upsetting (Lozoff et al., 1996). Moreover, a recent nation-wide study in the Netherlands reported that among Dutch mothers, co-sleeping was associated with higher maternal age, single parenthood, household crowding, lower maternal education, greater perceptions of infants' sleep problems, and greater maternal depression, but these linkages were not found among non-Dutch mothers (Luijk et al., 2013). The differential associations between co-sleeping practices, sociodemographics, mothers' perceptions of infants' sleep problems, and mothers' well-being between European descent and

non-European descent mothers suggests that the linkages between infants' sleep, parents' sleep, and well-being may also differ between these groups. Thus, the present study utilized only the data from two-parent European American families.

Family processes

Family systems are dynamic open systems in transformation, and constantly adapt to changing circumstances over time. Family systems have homeostatic features that maintain the stability of their patterns through which any behaviors deviated from the family's threshold of tolerance elicits a mechanism that returns to family equilibrium (Cox & Paley, 1998; Minuchin, 1974; Minuchin, 1985). Most families successfully adapt to changes in circumstances through mutual support, communications, and negotiations between parents, but in dysfunctional families, this process incorporates a family member's psychological symptoms or further problems through the circle of maladaptive transactions (Cox & Paley, 1998; Minuchin, 1974; Minuchin, 1985). The family's capacity to reorganize in response to changes becomes salient during the times of transition (Minuchin, 1974; Minuchin, 1985). For example, following the birth of a child, parents are required to change preexisting patterns and organize around the caregiving of the infant. How parents reorganize rules or roles in caregiving during the transition impacts their emotions and relationships with the partner, which compromise healthy child development. Further, the linkages between family systems and children's emotional and behavioral adjustment have been demonstrated cross-culturally, both in Western countries (Davies, Cummings, & Winter, 2004; McHale & Rasmussen, 1998; Sturge-Apple, Davies, & Cummings, 2010) and non-Western countries (Camarano, & Ivans, 2008, Gjerde & Shimizu, 1995; McHale, Rao, & Krasnow, 2000; Ogata & Miyashita, 2002). Thus, I expected that family processes, how parents adapt to the new circumstance through mutual support, may play an

important role in parents' sleep, well-being, and infants' sleep and development. I also expected that the influences of family processes on infants' sleep, parents' sleep, well-being, and child development may transcend the influence of sleeping arrangements.

Linkage between family, proximal parents' factors, and infants' sleep

Research examining the role of family context in infant sleep has been growing but is still limited. Nonetheless, several studies have demonstrated significant linkages between spousal/coparental relationships, parents' sleep, well-being, and infant sleep. A self-report study examining the role of fathers in child sleep disturbances reported that, among the families whose children had sleep disturbances, mothers reported greater levels of stress than mothers from the families whose children did not have sleep disturbances only when coupled with lower paternal involvements in child caregiving (Millikovsky-Ayalon, Atzaba-Poria, & Meiri, 2015). Another study using both subjective (sleep diary) and objective (actigraph) sleep measurements demonstrated that greater paternal involvement in infant care at 3 and 6 months was concomitantly and predictively associated with a lower number of infant long wake episodes (actigraph) and infants' night waking (sleep diary) at 6 months as well as a lower number of mothers' long wake episodes and higher maternal sleep efficiency (actigraph) at 6 months (Tikotzky et al., 2015). A study examining coparenting quality during the first three months revealed that, at both 1 and 3 months, the frequencies of infant night waking predicted both mothers' and fathers' poor sleep quality, which was in turn associated with their elevated depressive symptoms (McDaniel & Teti, 2012). However, more positive coparenting at 1 month was predictive of a decrease in both parents' depressive symptoms at 3 months (McDaniel & Teti, 2012). These studies indicate that a greater paternal involvement in infant care or a greater coparenting alliance improves infants' and parents' sleep, and buffers against parenting stress

and depression. However, these studies are single-point-in-time or very short-term longitudinal studies, and it is not clear how changes in the coparental alliance influence changes in parents' sleep, well-being, and infant sleep. Based on family systems theory, family processes, how well parents work as a team over time, may be associated with changes in infant sleep, parents' sleep, and well-being. Further, because the basic tenets of family systems theory have been cross-culturally validated (McHale et al., 2000), the associations between family processes, parents' sleep, well-being, and infant sleep may be independent of whatever sleeping arrangements parents used across the first year. The present study did not assess family functioning at one point in time, but assessed family *processes* (changes in family functioning over time), and examined whether family processes were associated with parents' sleep, well-being, and infant sleep, and whether these linkages remained, after controlling for sleeping arrangements parents used across the first year.

The present study

Given the empirical findings that persistent co-sleeping is associated with infants' night waking (Cortesi et al., 2008, Mindell et al., 2009), parents' reduced sleep (Sedeh et al., 2009; Teti, Shimizu, Crosby, & Kim, 2016), maternal depression (Cortesi et al., 2008; Teti et al., 2015), family and couple distress (Cortesi et al., 2008), and children's emotional and behavioral problems in school (Cortesi et al., 2008), the present study aimed to elucidate whether sleeping arrangements *per se* or family systems influence infants' and parents' sleep, parents' well-being, and children's socio-emotional development. The first aim of the present study was to examine whether family processes (changes in family functioning) were associated with changes in various measures of individuals' functioning within a family, and whether the association between family process and individuals' functioning is independent of whatever sleep

arrangements parents use. The second aim was to elucidate whether family processes were associated with infants' developmental outcomes, over and above the effects of infant sleeping arrangements. Past work suggests a strong linkage between poor family functioning, children's depression and anxiety problems (Camarano & Ivans, 2008; Jacobvitz, Hazen, Curran, & Hitchens, 2004; McHale et al., 2000), externalizing behaviors (Richmond & Stocker, 2006; Sturge-Apple et al., 2010), internalizing problems (Johnson, 2003), emotional dysregulation (Camarano & Ivans, 2008; Sturge-Apple et al., 2010), conduct problems (McHale et al., 2000), and insecure parent-child attachment (Hervey & Byrd, 2000). It is important to note that sleep is strongly associated with one's emotional and behavioral adjustment. Reduced sleep and disrupted sleep impede the cognitive processes in the prefrontal cortex that regulates attention, arousal, and emotion, which places a child at risk for internalizing and externalizing behavioral problems (Dahl, 1996; Kelly & El-Sheikh, 2014). Past work has demonstrated that reduced sleep duration and greater night waking were associated with greater levels of depression and anxiety symptoms (Alfano, Pina, Zerr, & Villalta, 2010; Paavonen, Solantaus, Almqvist, & Aronen, 2003), internalizing symptoms (El-Sheikh, Buckhalt, Mark Cummings, & Keller, 2007; Paavonen et al., 2003), externalizing symptoms (El-Sheikh et al., 2007; Holley, Hill, & Stevenson, 2001), and delinquent behavior (Paavonen et al., 2003) among older children. Further, reduction in the number of infant night wakings were associated with secure attachment with the mother, whereas continuity of greater night waking was associated with insecure attachment (Zentalla, Braungart-Riekerb, Ekasc, & Lickenbrockd, 2012). Thus, the second aim of the present study was to examine whether family processes in the first year of infant age were linked to infants' sleep quality (fragmentation) and socio-emotional development (attachment security, externalizing and internalizing problems, dysregulation, and competence) at 24 months,

independent of whatever sleep arrangements parents use.

Hypotheses

The following hypotheses were addressed:

Hypothesis 1. Family processes (how parents worked as a team over time) would be associated with changes in infants' sleep fragmentation, parents' sleep fragmentation, and parents' well-being during the first year. It was expected that family functioning and individual maladaptive functioning would be parallel processes, but in an opposite direction: family functioning at 1 month would be associated with individual functioning at 1 month, and an increase in family functioning (coparenting quality) over time would be associated with decreases in one's sleep fragmentation and depression across time.

Hypothesis 1b. These associations would remain, independent of whatever sleep arrangements parents use. I expected that the parallel processes of family and individual functioning would remain, after controlling for the effect of sleeping arrangements, with sleeping arrangements not associated with the initial status or the trajectories of family and individual functioning.

Hypothesis 2a. Family processes would predict infant sleep fragmentation and socio-emotional development at 24 months (infants' sleep quality, attachment, internalizing and externalizing behavioral problems, dysregulation, and competence). I expected that an increase in family functioning (i.e., slope) or the stability in greater family functioning (i.e., intercept without slope) would be associated with less sleep fragmentation, greater attachment security scores, fewer internalizing and externalizing behavioral problems, less dysregulation, and more competence when children were 24 months of age.

Hypothesis 2b. These associations would remain, independent of whatever sleep

arrangements parents use. That is, I expected that family processes would predict infant sleep quality and social-emotional development at 24 months, after controlling for the effect of sleeping arrangements, with sleeping arrangements not associated with child outcomes at 24 months.

Methods

Participants

Data were drawn from a longitudinal study of parenting and infant sleep across the infants' first two years of life (SIESTA: Study of Infants' Emergent Sleep Trajectories) (R01 HD052809). A coordinator recruited the mothers in local hospitals in central Pennsylvania within 2 days after delivery. Families were home-visited, and both mothers and fathers were asked to complete a variety of questionnaires pertaining to demographic information, infant sleep arrangements, and coparenting quality at 1, 3, 6, 9, 12, 18, and 24 months of infant age.

One hundred sixty seven infants (47% male) were originally recruited. Mothers' average age was 29.4 years old ($SD = 5.3$), ranging from 18 to 43 years old. The sample consisted of European American (EA) (84%), African-American (3%), Asian-American (4%), Latino (5%), and other ethnicities (4%). Eighty-seven percent of mothers completed post-secondary education. Median yearly family income was \$65,000 ($SD = \$47,000$), ranging from \$9,500 to \$300,000. Of the 167 families, 18 withdrew from the study between 1 and 18 months of infant age. There were no differences in income, number of children in the home, marital status, maternal age, education, or employment between the families who dropped from the study and the originally recruited sample. No differences were also found between the dropouts and the original sample in coparenting relationships or sleeping arrangements parents used when their infants were 1 month of age. Of 149 families who completed the project, the present study

examined the data at 1, 3, 6, 9, 12, and 24 months from 110 two-parent European American families where mothers were married and living with their husbands, or living with a partner who was a father-figure.

Distal environmental factors (from 1 to 12 months)

Cultural Norms: Infant sleeping arrangements

Because infant sleeping arrangements are culturally bound (Barry & Paxson, 1971; Mindell et al. 2010; Mindel, Sadeh, Koyama, & How, 2010), with the majority of the European American parents moving their infants to solitary sleep by 6 months (Hauck et al., 2008; Kendall-Tackett et al., 2011; McCoy et al., 2004; Teti et al., 2015), infant sleeping arrangements were categorized based on, not the sleeping arrangements parents used at a one point in time, but the patterns of sleeping arrangements parents used across the first year. The single item of the Sleep Practice Questionnaire (SPQ: Keller & Goldberg, 2004) asking an infant's sleeping location, "Where does your baby usually sleep at night?" will be utilized to determine the infant sleeping arrangement that participants used at 1, 3, 6, 9, and 12 months of infant age. Data will be dichotomized to solitary sleeping (sleeping in a separate room from parents all night) or co-sleeping (sleeping in parents' bed or parents' room part of the night or all night) at each of the five time points. Further, to identify the patterns of infant sleeping arrangements during the second half of the first year, the dichotomized data will be collapsed across all five time points to create two longitudinal sleep arrangement categories: families who consistently used solitary sleeping in the first year or switched to solitary sleeping by 6 months and continued to use this arrangement until 12 months (Solitary Sleeping) and families who co-slept with their infants beyond 6 months (Persistent Co-Sleeping). Solitary Sleeping indicates the sleeping arrangement that is consonant with European American cultural norms, whereas Persistent Co-Sleeping

suggests the sleeping arrangements that are dissonant with European American cultural norms regarding choices of infant sleeping arrangements.

Family: Family processes

Coparenting is a family level of analysis and distinct from marital relationships that exist at a mother-father dyadic level (Schoppe, Mangelsdorf, & Frosch, 2001; McHale, & Rasmussen, 1998; McHale, Johnson, & Sinclair, 1999) because coparenting dynamics necessarily includes a child (Schoppe et al., 2001). Thus, family functioning was assessed using the Coparenting Relationship Scale (CRS; Feinberg, Brown, & Kan, 2012). The CRS assesses parents' perception of how well mothers and their partners worked together as a child rearing team and contains 47 items, with each item rated on a 7-point scale (ranging from "not true of us" to "very true of us" or "never" to "very often"). The CRS taps into six dimensions of agreement with the partner (e.g., "My partner and I have different ideas about how to raise our child"), closeness (e.g., "The stress of parenthood has caused my partner and me to grow apart"), support (e.g., "My partner asks my opinion on issues related to parenting"), endorsement of the partner's parenting, (e.g., "My partner has a lot of patience with our child"), exposure to conflict (e.g., "Argue with your partner about your child in the child's presence"), competition-undermining (e.g., "My partner tries to show that she or he is better than me at caring for our child"), and satisfaction with division of labor (e.g., "My partner does not carry his or her fair share of the parenting work." Reverse coded). Adequate internal reliability and construct validity of the CRS have been demonstrated (Feinberg et al., 2012). Positive coparenting dimensions (agreement, closeness, support, endorsement, and division of labor) were significantly intercorrelated at each of the five time points, and these dimensions were summed to create a positive coparenting composite at each time point, α (mothers' positive coparenting) = .81 to .85, and α (fathers'

positive coparenting) = .75 to .81. The two dimensions of negative coparenting (exposure to conflict and competition-undermining) were also significantly intercorrelated at each of the five time points, and these two dimensions will be summed to create a negative coparenting composite at each time point, α (mothers' negative coparenting) = .74 to .82, and α (fathers' negative coparenting) = .70 to .81. To create overall family functioning in the first year, scores on mothers' and fathers' perceptions of negative coparenting were subtracted from scores on both parents' perceptions of positive coparenting (i.e., mother-reported positive coparenting + father-reported positive coparenting – mother-reported negative coparenting – father-reported negative coparenting).

Proximal parents' factors (from 1 to 12 months)

Parents' well-being: Depressive symptoms

The severity of both parents' depressive symptoms was assessed using the well-known depression subscales of the Symptom Checklist-90-Revised (SCL-90-R: Derogatis, 1999). The depression subscale contains 13 items including “Crying easily,” “Blaming yourself for things,” and “Worrying too much about things.” Each item was rated on a 5-point scale ranging from 0 “not at all” to 4 “extremely.” The total score was computed by summing the score for each item, ranging from 0 to 52. Inter-item reliability of the depression subscale was high, ranging from .89 to .90 for mothers and .88 to .90 for fathers.

Parents' sleep fragmentation (from 1 to 12 months) and infants' sleep fragmentation (from 1 to 12 months and at 24 months)

Parents' and infants' sleep quality was measured by an objective assessment of sleep, actigraphy. Both parents were instructed to wear the Mini-Mitter Actigraphy wristwatches (Model AW-64) throughout the visit week at each month of data collection and put on the same

model of watch on the infant's calf. The actigraph wristwatches recorded the participants' physical activity level, from which data regarding their sleep and awakenings could be obtained. These recordings were downloaded after the visit onto computers and read by the software Actiware version 5. Sleep fragmentation, which was operationalized as the sum of percent mobile and percent immobile bouts less than a 1 minute duration to the number of immobile bouts, was utilized as an inverse index of sleep quality. The sleep fragmentation scores were averaged across seven days at each month of data collection to provide a relatively reliable sleep score.

Other child outcomes (24 months)

Attachment security

At the 24-month home visit, one of three trained coders, who were blind to all other observational data, observed mother-infant interactions for 1.5 to 2 hours. After the home observation of the infant-mother interactions, coders assessed infant attachment security, using the Attachment Q-Set procedure (AQS; Waters & Deane, 1985). The AQS assesses young children's secure base behavior in the familiar home environment. It includes 90 items, which are sorted into 9 piles of 10 items, ranging from 1 "very much unlike the child" to 9 "very much like the child". An attachment security score for each infant was obtained by correlating each item's score with a Security Criterion Sort of the hypothetically most secure child (Waters, Vaughn, Posada, & Kondo-Ikemura, 1995). Higher AQS scores indicated more secure attachment in the infant. In our sample, a mean AQS score was .41 with standard deviation of .22, ranging from -.38 to .75. Inter-coder reliability was excellent (ICC for absolute agreement = .95). The reliability and validity of AQS have been well-established (See a meta-analysis by van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004).

Social-emotional adjustment

Children's social-emotional adjustment was assessed using the Infant-Toddler Social and Emotional Assessment (ITSEA: Carter, Briggs-Gowan, Jones, & Little, 2003). At the 24-month home visit, mothers were asked to complete this questionnaire. The ITSEA assesses child behavior in four domains: Externalizing (activity/impulsivity, aggression/defiance, and peer aggression subscales, $\alpha = .84$), Internalizing (depression/withdrawal, general anxiety, separation distress, and inhibition to novelty subscales, $\alpha = .80$), Dysregulation (sleep, negative emotionality, eating, and sensory sensitivity subscales, $\alpha = .83$), and Competency (attention, compliance, imitation/play, mastery motivation, empathy, and prosocial peer relations subscales, $\alpha = .84$). The ITSEA includes 125 items rated on a 3-point scale (0 "not true/rarely," 1 "somewhat true/sometimes," 2 "very true/often"). The ITSEA has been shown to have strong factorial validity between each of the four domains and the corresponding subscales, and satisfactory construct validity and test-retest reliability (Briggs-Gowan & Carter, 1998; Carters, 2002; Carter et al., 2003).

Statistical analytic strategies

To test Hypothesis 1a and b, a series of the latent linear growth models for two parallel processes was fitted to the data, using *Mplus 7*. First, the latent linear growth model was fitted separately to each of the data for coparenting quality, infants', mothers' and fathers' sleep fragmentation, and both parents' depressive symptoms in the first year (Model 1) (See Figure 2-1). The time scores for the slope growth factor were fixed at 0, 0.2, 0.5, 0.8, and 1.1 to define a linear growth model. Next, the latent linear growth model for two parallel processes was fitted to the data for coparenting quality and each of remaining variables (Model 2) (See Figure 2-1). I was particularly interested in whether (1) the intercept of coparenting, $i1$, would covary with the

intercept of an individual's functioning, i_2 , and (2) the slope variance of coparenting, s_1 , would covary with the slope variance of an individual's functioning, s_2 . Lastly, the patterns of the sleeping arrangements parents used in the first year were included in the model as a covariate (Model 3) (See Figure 2-1) to examine whether the parallel processes of family and individual functioning remained, after controlling for sleeping arrangements.

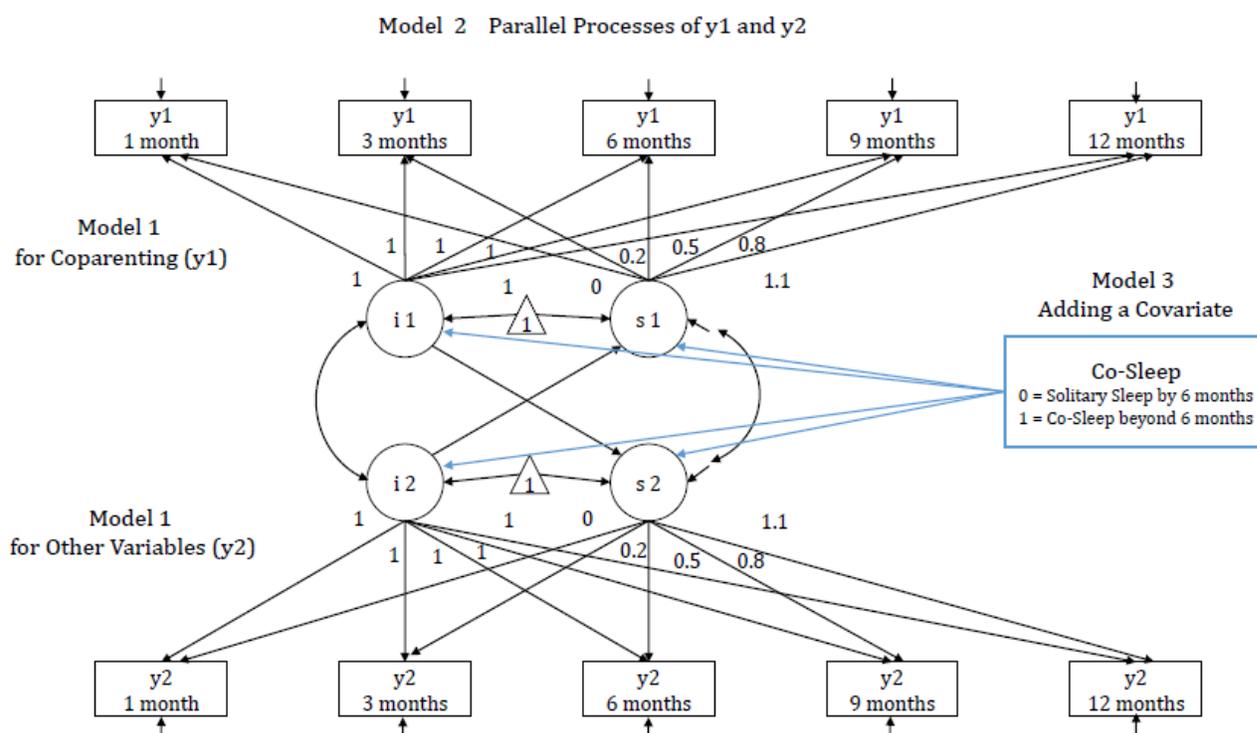


Figure 2-1. Models for Hypothesis 1a: the latent linear models (Model 1), and the latent linear growth models for two parallel processes (Model 2), and a model for Hypothesis 1b: trajectories of coparenting and other individual functioning are related, after controlling for sleeping arrangements (Model 3). s represents slopes; i represents intercepts; a triangle with 1 represents means. y_1 is coparenting quality. y_2 is infants' sleep fragmentation, mothers' sleep fragmentation, fathers' sleep fragmentation, mothers' depressive symptoms, or fathers' depressive symptoms.

To test Hypothesis 2a and 2b, a series of latent linear growth models were fitted to the data (*Mplus 7*). First, because the latent factors (i.e., slope and intercept) became predictors for Hypothesis 2, coparenting quality was grand-mean centered so that the intercept was a meaningful value. Then, the latent linear growth model was fitted to the data (Model 4). Next, each of the child outcome variables at 24 months (infants' sleep fragmentation, attachment security, externalizing problems, internalizing problems, dysregulation, or competence) was included in the model (Model 5) (See Figure 2-2). Lastly, the patterns of the sleeping arrangements parents used in the first year was included into the model as a covariate (Model 6) (See Figure 2-2) to examine whether the trajectories of coparenting quality predict a child outcome, independent of the sleeping arrangements parents used across the first year.

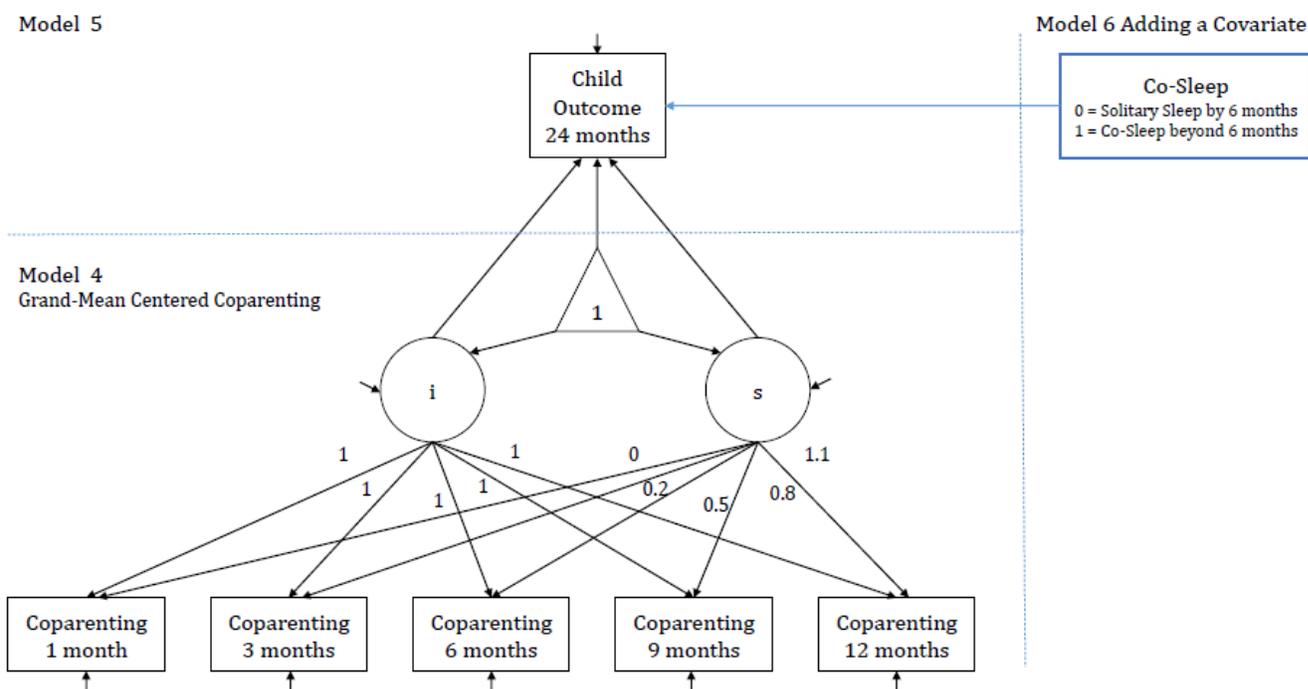


Figure 2-2. A model for Hypothesis 2a: the latent linear growth models predicting a child outcome at 24 months (Model 5), and a model for Hypothesis 2b: the latent linear growth models predicting a child outcome at 24 months, after controlling for sleeping arrangements (Model 6). *s* represents slopes; *i* represents intercepts; a triangle with 1 represents means.

For both the latent linear growth model and the latent linear growth model for two parallel processes, the final model had to meet the following criteria on at least two of the four fit indices (Brown, 2006; Gates & Molenaar, 2012): values of root mean square error of approximation (RMSEA) less than .05, comparative fit index (CFI) greater than .95, Tucker-Lewis index (TLI) greater than .95, and standardized root mean square residual (SRMR) less than .05. The final model was determined by using $\Delta\chi^2$ tests. Similarly, $\Delta\chi^2$ tests were used to test Hypothesis 1b and 2b: whether Model 3 was more robust than Model 2, and whether Model 6 was more robust than Model 5. If so, this suggests that, independent of whatever sleeping arrangements parents used across the first year, family processes and an individual's functioning are the parallel processes, and family processes predict infant sleep quality and socio-emotional development at 24 months,

Results

Preliminary analyses

Tale 2-1 presents the results of correlation analyses among coparenting, infants', fathers', and mothers' sleep fragmentation, and fathers' and mothers' depressive symptoms in the first year. As can be seen in the table, coparenting quality at one time point was significantly correlated with the scores at the subsequent time point, $.81 < r < .96, p < .001$, and the scores at any of the five time points were significantly correlated with one another, $.77 < r < .86, p < .001$. This was found for all the individual functioning variables, $.01 < ps < .001$. Further, coparenting was negatively associated with fathers' sleep fragmentation and mothers' depression at 1 month, with both fathers' and mothers' depression at 3 months, with mothers' sleep fragmentation and both parents' depression at 6 and 9 months, and with mothers' depression at 12 months, $ps < .05$.

As for sleeping arrangements, 69% of the families ($n = 76$) moved their infants to a separate room by 6 months, and 31% of families ($n = 34$) persistently co-slept with their infants beyond 6 months. Infant sleep fragmentation was not associated with coparenting or an individual functioning at any time point, except infants' and mothers' sleep fragmentation. Sleeping arrangements were associated with infant sleep fragmentation at 12 months, $r = -.19$, $p < .05$, and mothers' sleep fragmentation from 3 to 12 months, $.27 < r < .34$, $ps < .01$, albeit these associations were weak.

Table 2-1. *Correlations among variables*

	1	2	3	4	5	6	7	8	9	10
1 Cop 1 month	1.00									
2 Cop 3 months	.81***	1.00								
3 Cop 6 months	.81***	.81***	1.00							
4 Cop 9 months	.77***	.82***	.86***	1.00						
5 Cop 12 months	.77***	.83***	.86***	.96***	1.00					
6 Infant Slp Frag 1 months	-.06	-.07	-.10	-.06	-.08	1.00				
7 Infant Slp Frag 3 months	-.06	-.01	-.10	-.11	-.05	.45***	1.00			
8 Infant Slp Frag 6 months	.04	-.04	.00	-.03	-.01	.31***	.56***	1.00		
9 Infant Slp Frag 9 months	-.07	-.05	.02	-.03	-.01	.44***	.33***	.42***	1.00	
10 Infant Slp Frag 12 months	.06	-.02	.03	.03	.02	.28**	.28**	.45***	.45***	1.00
11 Father Slp Frag 1 months	-.22*	-.19*	-.15	-.26**	-.20	.32***	.25**	.09	.22*	.19*
12 Father Slp Frag 3 months	-.13	-.10	.03	-.10	-.12	.10	.12	.05	.03	.18*
13 Father Slp Frag 6 months	.02	-.09	.02	-.07	-.08	.19*	.08	.10	.22*	.21*
14 Father Slp Frag 9 months	-.01	-.02	.05	.04	-.01	.23*	.12	.08	.25**	.21*
15 Father Slp Frag 12 months	-.01	.02	.03	-.02	-.01	.12	.00	-.10	.10	.10
16 Mother Slp Frag 1 months	-.14	-.08	-.13	-.15	-.14	.23*	.16	.17	.19*	.17
17 Mother Slp Frag 3 months	-.13	-.09	-.19*	-.15	-.11	.11	.11	.13	.17	.10
18 Mother Slp Frag 6 months	-.14	-.15	-.20*	-.12	-.19*	.13	.06	.02	.08	.13
19 Mother Slp Frag 9 months	-.27**	-.19*	-.17	-.19*	-.16	.09	.07	.03	.16	.10
20 Mother Slp Frag 12 months	-.03	-.01	-.08	.07	.05	.11	-.14	-.17	.05	.06
21 Father Dep 1 month	-.13	-.23*	-.21*	-.14	-.10	.21*	.15	.03	.10	.02
22 Father Dep 3 month	-.19*	-.30*	-.29**	-.21*	-.21*	.18*	.06	.03	.09	-.05
23 Father Dep 6 month	-.28**	-.36***	-.20*	-.24**	-.20*	.13	.11	.13	.21*	-.05
24 Father Dep 9 month	-.25**	.35***	-.23**	-.27**	-.18	.04	.16	.11	.22*	-.01
25 Father Dep 12 month	-.04	-.17	-.10	-.12	-.15	.03	-.13	-.02	.05	-.02
26 Mother Dep 1 months	-.22*	-.15	-.16	-.16	-.13	.01	.06	.06	.05	-.13
27 Mother Dep 3 months	-.20*	-.20*	-.18	-.10	-.15	.05	-.05	-.03	.07	.10
28 Mother Dep 6 months	-.37***	.34**	-.42***	-.34***	-.34***	-.03	.05	.10	.10	.02
29 Mother Dep 9 months	-.34***	-.34***	-.33***	-.36***	-.30***	.12	.07	.04	.25**	-.02
30 Mother Dep 12 months	-.36***	-.33***	-.40	-.34***	-.29**	-.02	.02	-.07	.04	-.04
31 Co-Sleep	-.12	-.095	-.11	-.14	-.08	.09	.00	-.12	-.052	-.19*

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 110$. Cop = Coparenting. Slp Frag = Sleep Fragmentation. Dep = Depressive symptoms. Sleeping Arrangements (Co-Sleep): 0 = Solitary Sleeping (Sleeping in a separate room by 6 months, $n = 76$), 1 = Persistent Co-Sleeping (Co-sleeping beyond 6 months, $n = 34$).

Table 2-1. *Correlations among variables - Continued*

	11	12	13	14	15	16	17	18	19	20
11 Father Slp Frag 1 months	1.00									
12 Father Slp Frag 3 months	.57***	1.00								
13 Father Slp Frag 6 months	.47***	.24**	1.00							
14 Father Slp Frag 9 months	.47***	.53***	.59***	1.00						
15 Father Slp Frag 12 months	.43***	.28**	.58***	.59***	1.00					
16 Mother Slp Frag 1 months	.22*	.00	.04	.14	.10	1.00				
17 Mother Slp Frag 3 months	.08	-.16	.09	.15	.18*	.53***	1.00			
18 Mother Slp Frag 6 months	.19*	-.03	.07	.14	.20*	.39***	.49***	1.00		
19 Mother Slp Frag 9 months	.20*	-.08	.21*	.24**	.23*	.37***	.50***	.56***	1.00	
20 Mother Slp Frag 12 months	.17	-.02	.15	.29**	.34***	.27**	.44***	.64***	.64***	1.00
21 Father Dep 1 month	.04	-.09	.05	-.13	-.02	.08	-.08	-.03	.09	.00
22 Father Dep 3 month	.05	-.12	.02	-.13	-.01	.07	.03	.03	.11	.01
23 Father Dep 6 month	.13	-.06	.02	-.14	.00	.07	-.01	-.03	.19*	-.05
24 Father Dep 9 month	.21*	-.12	.12	-.14	-.04	.10	.06	.02	.11	-.09
25 Father Dep 12 month	-.10	-.12	.00	-.14	-.03	.06	.03	-.01	.04	-.09
26 Mother Dep 1 months	-.08	-.04	-.18	-.17	-.04	-.13	-.18*	-.20*	-.05	-.05
27 Mother Dep 3 months	.06	.08	-.07	-.10	-.07	-.15	-.17	-.13	-.01	.03
28 Mother Dep 6 months	.13	.03	-.06	-.06	-.03	-.07	-.01	-.06	.04	.09
29 Mother Dep 9 months	.09	.02	-.12	-.09	.02	-.07	-.08	-.23*	-.04	-.03
30 Mother Dep 12 months	.11	-.07	-.17	-.16	-.08	-.05	.10	-.01	.11	.12
31 Co-Sleep	.13	-.11	.071	.11	.20	.14	.27**	.34***	.30***	.29**
	21	22	23	24	25	26	27	28	29	30
21 Father Dep 1 month	1.00									
22 Father Dep 3 month	.83***	1.00								
23 Father Dep 6 month	.70***	.79***	1.00							
24 Father Dep 9 month	.63***	.68***	.76***	1.00						
25 Father Dep 12 month	.61***	.74***	.64***	.58***	1.00					
26 Mother Dep 1 months	.10	.07	.20*	.10	.06	1.00				
27 Mother Dep 3 months	.14	.18*	.25**	.11	-.04	.59***	1.00			
28 Mother Dep 6 months	.18*	.18*	.26**	.24**	.06	.60***	.59***	1.00		
29 Mother Dep 9 months	.23*	.19*	.33***	.28**	.15	.67***	.51***	.77***	1.00	
30 Mother Dep 12 months	.25**	.26*	.27**	.35***	.14	.47***	.43***	.77***	.67	1.00***
31 Co-Sleep	-.08	-.02	-.02	.00	-.10	.08	-.01	.12	.11	.13

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 110$.

Means, standard deviations and the results of correlations between coparenting, sleeping arrangements, and child outcomes at 24 months are presented in Table 2-2. Infants' sleep fragmentation at 24 months was associated with coparenting quality at 12 months, $r = .19$, $p < .05$, and attachment security was associated with coparenting at 1 month, $r = .20$, $p < .05$. Externalizing problems were negatively associated with coparenting at all the time points, $-.28 < r < -.23$, $ps < .05$. Competency was positively associated with coparenting at 1, 3, and 12 months, $.22 < r < .25$, $ps < .05$. Sleeping arrangements parents used across the first year was unrelated to any of the child outcomes (See Table 2-2).

Table 2-2. Means, standard deviations, and correlations between coparenting, sleeping arrangements, and child outcomes at 24 months

	<i>M</i>	<i>SD</i>	Coparenting (in Months)					Co-Sleep
			1	3	6	9	12	
Infant Slp Frag	53.95	9.98	.18	.15	.11	.15	.19*	-.08
Attachment	0.46	0.22	.20*	.16	.12	.10	.10	-.14
Externalizing	34.79	14.31	-.24**	-.28**	-.23*	-.24**	-.23*	.15
Internalizing	25.36	8.01	-.07	-.11	-.13	-.14	-.13	-.04
Dysregulation	35.55	10.13	-.14	-.21*	-.15	-.13	-.18	.11
Competency	86.23	10.41	.24**	.25**	.16	.16	.22*	-.01

Notes. * $p < .05$, ** $p < .01$. $N = 110$. Slp Frag = Sleep Fragmentation. Sleeping Arrangements (Co-Sleep): 0 = Solitary Sleeping (Sleeping in a separate room by 6 months, $n = 76$), 1 = Persistent Co-Sleeping (Co-sleeping beyond 6 months, $n = 34$).

Hypothesis 1: (a) Family processes would be associated with the trajectories of infants' sleep fragmentation, parents' sleep fragmentation, and parents' well-being in the first year, and (b) These associations would be independent of whatever sleep arrangements parents use.

Model 1

To begin with, the latent linear growth model was fitted separately to the data for each of

family functioning variables (coparenting) and individual functioning variables (infants', fathers, and mothers' sleep fragmentation, and fathers' and mothers' depressive symptoms). Residuals were allowed to correlate.

The final model that was fit to examine the trajectory of coparenting was not a satisfactory fit to the data, $\chi^2(7) = 34.42, p = 0.00, RMSEA = 0.19, CFI = 0.96, TLI = 0.94, SRMR = 0.27$. Further, the results suggested that both the fixed effect and the variance of slope was not significant ($\mu_{slope} = 0.28, p = 0.88$ and $\sigma^2_{slope} = 129.14, p = 0.26$, respectively). Thus, the slope factor was removed from the model, meaning that the trajectory of coparenting had no growth, and the model was re-examined. Table 2-3 presents values of χ^2 , degree of freedom (*df*), χ^2 *p*-value, RMSEA, CFI, TLI, and SRMR for the final models that were fit to examine the trajectories of coparenting, infants', fathers', and mothers' sleep fragmentation, and fathers' and mothers' depressive symptoms. As can be seen in the table, all models were an acceptable fit to the data, except for infants' and mothers' sleep fragmentation.

Table 2-3. *Fit indices for the final models*

	χ^2	<i>df</i>	χ^2 <i>p</i> -value	RMSEA	CFI	TLI	SRMR
Cop	10	35.86	.001	0.15	0.96	0.96	0.28
Infant Slp Frag	12	237.58	.000	0.41	0.00	-0.49	0.67
Father Slp Frag	7	12.50	.085	0.08	0.97	0.96	0.07
Mother Slp Frag	9	84.01	.000	0.28	0.62	0.58	0.30
Father Dep	9	12.92	.167	0.06	0.99	0.99	0.05
Mother Dep	7	10.611	.157	0.07	0.99	0.98	0.04

Notes. *N* = 110. Cop = Coparenting. Slp Frag = Sleep Fragmentation. Dep = Depressive symptoms.

Model 2

Next, the latent linear growth model for the two parallel processes was fitted to a pair of the data for coparenting quality and for each of the other variables. Because the models for

infants' and mothers' sleep fragmentation were not a satisfactory fit to the data, these variables were not utilized in Model 2. The results revealed that the growth model for the parallel processes of coparenting and fathers' sleep fragmentation was an acceptable fit to the data, $\chi^2(40) = 75.28, p = .00, RMSEA = 0.09, CFI = 0.96, TLI = 0.95, SRMR = 0.16$. However, the intercept of coparenting did not significantly covary with the intercept of fathers' sleep fragmentation, $\sigma^2_{i1i2} = -43.90, p = .11, N.S.$, or predict the slope of fathers' sleep fragmentation, $\beta_{i1s2} = 0.07, p = 0.06, N.S.$

The fit indices for fitting the linear growth model for the parallel processes of coparenting and fathers' depression suggested a less than satisfactory fit to the data, $\chi^2(43) = 126.18, p = .00, RMSEA = 0.13, CFI = 0.93, TLI = 0.92, SRMR = 0.16$. On the other hand, the growth model for the parallel processes of coparenting and mothers' depressive symptoms was an acceptable fit to the data, $\chi^2(40) = 80.28, p = .00, RMSEA = 0.10, CFI = 0.96, TLI = 0.95, SRMR = 0.16$. The results suggested that the intercept of coparenting significantly covaried with the intercept of mothers' depressive symptoms, $\sigma^2_{i1i2} = -45.25, p < .01$, suggesting that mothers who experienced greater coparenting alliance at 1 month reported fewer depressive symptoms at 1 month. However, the intercept of coparenting did not significantly predict the trajectory of mothers' depressive symptoms, $\beta_{i1s2} = -0.01, p = .48, N.S.$

Model 3

Lastly, sleeping arrangements were included to the latent linear growth model for two parallel processes as a covariate. Because the growth model for the parallel processes of coparenting and fathers' depression were a less than satisfactory fit to the data in Model 2, the model fit of this pair was not examined.

The final model for the parallel processes of coparenting and fathers' sleep fragmentation

turned to be a less than satisfactory fit to the data, $\chi^2(49) = 97.09.21, p = .00, RMSEA = 0.09, CFI = 0.94, TLI = 0.94, SRMR 0.17$. But, the final model for the parallel processes of coparenting and mothers' depressive symptoms was an acceptable fit to the data, $\chi^2(48) = 92.31, p = .00, RMSEA = 0.09, CFI = 0.96, TLI = 0.95, SRMR 0.18$. Figure 2-3 presents parameter estimates for the linear growth model for the parallel processes of coparenting and mothers' depressive symptoms, after controlling for the effect of sleeping arrangements parents used in the first year. The results suggested that coparenting quality at 1 month was significantly associated with mothers' depressive symptoms at 1 month, $\sigma^2_{s1s2} = -10.98, p < .001$, and higher coparenting quality over time predicted a decrease in mothers' depressive symptoms over time, after controlling for the effect of sleeping arrangements, $\beta_{i1s2} = -.04, p < .01$ (See Figure 2-3). Further, sleeping arrangements were unrelated to the initial status of coparenting quality, the initial status of mothers' depressive symptoms, nor the trajectories of mothers' depressive symptoms, $\beta_{cosleep-i1} = -6.54, p = .30, N.S., \beta_{cosleep-i2} = .69, p = .55, N.S,$ and $\beta_{cosleep-s2} = .32, p = .75, N.S.$ (See Figure 2-3). $\Delta\chi^2$ tests suggested that Model 3 was more robust than Model 2, $\Delta\chi^2(8) = 12.03, p = .15$. This suggested that coparenting quality and mothers' depression were the parallel processes in an opposite direction, with greater coparenting quality at 1 month associated with less maternal depression at 1 month and greater coparenting quality over time predicting a decrease in maternal depression over time, independent of whatever sleeping arrangements parents used across the first year.

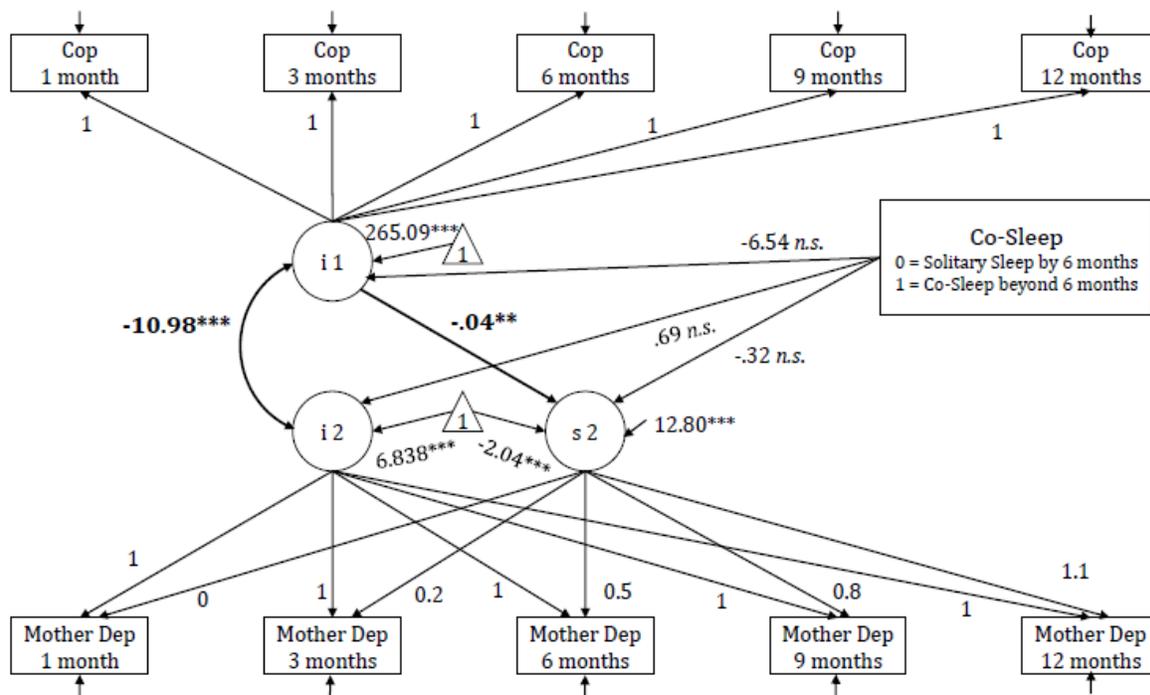


Figure 2-3. The linear growth model for the parallel processes of coparenting quality and mothers' depressive symptoms, after controlling for the effect of sleeping arrangements parents used in the first year. $**p < .01$, $***p < .001$.

Hypothesis 2: (a) Family processes would predict infant sleep quality and socio-emotional outcomes at 24 months, and (b) Family processes would predict these child outcomes, independent of whatever sleep arrangements parents use.

As noted above, a series of the latent linear growth models were fitted to the data to test Hypothesis 2a and 2b. First, coparenting quality was grand-mean centered so that the intercept was a meaningful value, and then the latent linear growth model was fitted to the data (Model 4). Next, a child outcome variable at 24 months was included into the model (Model 5), and the model fit was examined separately for each of the child outcomes. Lastly, the patterns of the sleeping arrangements parents used across the first year was included into the model as a covariate (Model 6) (See Figure 2-2).

Model 4

The results of the latent linear growth model that was fitted to examine the trajectory of grand-mean centered coparenting suggested that the value of slope variance was negative ($\sigma^2_{slope} = -17.44, p = .91$), indicating that the latent variable covariance matrix was not positive definite. Thus, the variance of slope was fixed to be zero, and then model fit was re-examined by allowing the residuals of coparenting to correlate. The final model was an acceptable fit to the data, $\chi^2 (9) = 21.12, p = .01, RMSEA = 0.11, CFI = 0.98, TLI = 0.98, SRMR 0.08$. This indicated that families who had greater coparenting quality than the mean level at 1 month had consistently higher coparenting quality over time, whereas families who had lower coparenting quality than the mean level at 1 month had consistently lower coparenting quality over time.

Model 5

All the models that were fit to examine the predictive associations between coparenting quality over time and children's developmental outcomes at 24 months were an acceptable fit to the data: for infant sleep fragmentation, $\chi^2 (13) = 25.57, p = 0.02, RMSEA = 0.09, CFI = 0.98, TLI = 0.98, SRMR = 0.07$; for attachment security, $\chi^2 (13) = 24.41, p = .03, RMSEA = 0.09, CFI = 0.98, TLI = 0.98, SRMR 0.07$; for externalizing problems, $\chi^2 (13) = 22.80, p = 0.04, RMSEA = 0.08, CFI = 0.99, TLI = 0.98, SRMR 0.07$; for internalizing problems, $\chi^2 (13) = 22.06, p = 0.05, RMSEA = 0.08, CFI = 0.99, TLI = 0.98, SRMR 0.07$; for dysregulation, $\chi^2 (13) = 23.61, p = .03, RMSEA = 0.09, CFI = 0.98, TLI = 0.98, SRMR 0.07$; for competency, $\chi^2 (13) = 26.40, p = 0.02, RMSEA = 0.10, CFI = 0.98, TLI = 0.98, SRMR 0.07$. Table 2-4 presents the parameter estimates for fitting Model 5 to the data. The results suggested that children from the families who had greater coparenting quality than the mean level over time exhibited fewer externalizing problems, and less dysregulation (i.e., more regulation), and more competency at 24 months, *ps*

< .05. Coparenting quality over time did not significantly predict infant sleep fragmentation, attachment security, or internalizing problems at 24 months (See Table 2-4, Model 5).

Model 6

All the models that included sleeping arrangements as a covariate were a good fit to the data: for infant sleep fragmentation, $\chi^2(18) = 30.26, p = 0.04, RMSEA = 0.08, CFI = 0.98, TLI = 0.98, SRMR = 0.07$; for attachment security, $\chi^2(18) = 28.82, p = .05, RMSEA = 0.07, CFI = 0.98, TLI = 0.98, SRMR = 0.07$; for externalizing problems, $\chi^2(18) = 27.12, p = 0.08, RMSEA = 0.07, CFI = 0.99, TLI = 0.98, SRMR = 0.07$; for internalizing problems, $\chi^2(18) = 26.60, p = 0.09, RMSEA = 0.07, CFI = 0.99, TLI = 0.98, SRMR = 0.07$; for dysregulation, $\chi^2(18) = 28.71, p = .05, RMSEA = 0.07, CFI = 0.98, TLI = 0.98, SRMR = 0.07$; for competency, $\chi^2(18) = 30.89, p = 0.03, RMSEA = 0.08, CFI = 0.98, TLI = 0.98, SRMR = 0.07$. The results suggested that greater coparenting quality over time was predictive of children's fewer externalizing problems, less dysregulation, and more competency at 24 months, after controlling for the effects of sleeping arrangements parents used across the first year, $ps < .05$ (See Table 2-4, Model 6). Further, sleeping arrangements were associated with none of the child outcomes at 24 months. $\Delta\chi^2$ tests suggested that Model 6 was more robust than Model 5 for all the child outcomes: child sleep fragmentation, $\Delta\chi^2(5) = 4.69, p = .45$, attachment security, $\Delta\chi^2(5) = 4.41, p = .49$, externalizing problems, $\Delta\chi^2(5) = 4.32, p = .50$, dysregulation, $\Delta\chi^2(5) = 5.10, p = .40$, and competency, $\Delta\chi^2(5) = 4.49, p = .48$. Together with the results of Model 5, the results of Model 6 suggested that coparenting quality that was higher than the mean level over time predicted fewer externalizing problems, less dysregulation, and more competency at 24 months, independent of whatever sleeping arrangements parents used across the first year (See Table 2-4, Model 6).

Table 2-4. *Parameter estimates for fitting models examining the trajectories of grand-mean centered coparenting over time (Model 4), and the predictive associations between coparenting quality in the first year and child outcomes at 24 months (Model 5), after controlling for sleeping arrangements parents used across the first year (Model 6)*

Parameters	<u>Infant Slp Frag</u>			<u>Attachment</u>		<u>Externalizing</u>	
	Model 4	Model 5	Model 6	Model 5	Model 6	Model 5	Model 6
Intercept → Child Outcome		.05	.05	.00	.00	-.12**	-.12**
Co-Sleep → Child Outcome			-1.5		-0.06		4.00
Means							
Intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Intercepts							
gmccop 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Child Outcome		53.95***	54.41***	0.46***	0.48***	34.79***	33.56***
Variances							
Intercept	921.54***	918.88***	918.95***	920.82***	920.83***	921.34***	921.27***
Slope	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residual Variances							
gmccop 1	314.40***	310.14***	310.43***	312.93***	313.22***	313.03***	313.46***
gmccop 3	111.29***	114.40***	114.20***	111.55***	111.42***	109.47**	109.27**
gmccop 6	123.11***	127.60***	127.40***	124.82***	124.67***	125.84***	125.70***
gmccop 9	576.77***	574.13***	574.44***	575.16***	575.59***	574.08***	574.82***
gmccop 12	268.53***	265.21***	265.40***	267.93***	268.06***	268.40***	268.59***
Child Outcome		96.40***	95.93***	0.05***	0.05***	188.69***	185.33***

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 110$. Slp Frag = Sleep Fragmentation. Sleeping Arrangements (Co-Sleep): 0 = Solitary Sleeping (Sleeping in a separate room by 6 months), 1 = Persistent Co-Sleeping (Co-sleeping with parents beyond 6 months). gmccop = Grand-mean centered scores on coparenting. The number after gmccop indicates infants' age in months.

Table 2-4. *Continued.*

Parameters	Model 4	<u>Internalizing</u>		<u>Dysregulation</u>		<u>Competency</u>	
		Model 5	Model 6	Model 5	Model 6	Model 5	Model 6
Intercept → Child Outcome		-.03	-.03	-.07*	-.06*	.08*	.08*
Co-Sleep → Child Outcome			-.83		1.98		.31
Means							
Intercept	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Intercepts							
gmccop 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 9	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gmccop 12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Child Outcome		25.36***	25.62***	35.55***	34.94***	86.23***	86.14***
Variances							
Intercept	921.54***	921.61***	921.66***	921.35***	921.34***	918.50***	918.46***
Slope	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residual Variances							
gmccop 1	314.40***	314.37***	314.30***	316.24***	316.38***	311.18***	311.14***
gmccop 3	111.29***	111.65***	111.70***	108.54**	108.51**	111.80***	111.81***
gmccop 6	123.11***	122.85***	122.85***	123.82***	123.76***	128.90***	128.94***
gmccop 9	576.77***	576.78***	576.66***	579.24***	579.50***	575.49***	575.43***
gmccop 12	268.53***	268.35***	268.30***	269.92***	269.97***	266.40***	266.38***
Child Outcome		62.67***	62.52***	97.73***	96.90***	101.95***	101.93***

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. $N = 110$. Sleeping Arrangements (Co-Sleep): 0 = Solitary Sleeping (Sleeping in a separate room by 6 months), 1 = Persistent Co-Sleeping (Co-sleeping with parents beyond 6 months). gmccop = Grand-mean centered scores on coparenting. The number after gmccop indicates infants' age in months.

Discussion

To my knowledge, this is the first study to examine whether dynamic family processes (changes in coparenting quality over time) influence an individual's functioning during the first year and children's developmental outcomes at a later age, and whether the effect of family processes on an individual's functioning and children's developmental outcomes transcend the effect of sleeping arrangements parents used across the first year. Given the common notions that infant sleeping arrangements, particularly co-sleeping, impacts infants' sleep (Cortesi et al., 2008, Mindell et al., 2009), parents' sleep (Sedeh et al., 2009; Teti et al., 2016), parents' well-being (Cortesi et al., 2008; Teti et al., 2015), couple relationships (Cortesi et al., 2008), and children's emotional and behavioral adjustment in school (Cortesi et al., 2008), it is crucial to elucidate whether sleeping arrangements *per se* or family systems influence infants' and parents' sleep, parents' well-being, and children's socio-emotional development.

Built on family systems theory (Cox & Paley, 1998; Minuchin, 1974; Minuchin, 1985), the present study of a European American sample examined whether family processes were associated with the trajectories of infants' and parents' sleep, and parents' well-being in the first year, and with infants' sleep and socio-emotional development at a later age, independent of whatever sleep arrangements parents use. The results of a series of the latent linear growth models and the latent growth models for two parallel processes revealed that family processes during the first year played an important role in an individual's functioning as well as children's developmental outcomes, regardless of the types of sleeping arrangements parents used during the first year. Indeed, sleeping arrangements were unrelated to the associations between family processes, an individual's functioning, and children's developmental outcomes.

Family functioning, individual functioning, and infant sleeping arrangements

It was hypothesized that (a) family processes would be associated with the trajectories of infants' sleep fragmentation, parents' sleep fragmentation, and parents' well-being in the first year, and (b) these associations would be independent of the sleep arrangements parents used. These hypotheses were supported primarily for maternal depression. The results of the present study suggested that coparenting quality and mothers' depression were the parallel processes in an opposite direction: greater coparenting quality at 1 month was associated with less maternal depression at 1 month, and greater coparenting quality over time predicted a decrease in maternal depression over time, independent of whatever sleeping arrangements parents used across the first year. Further, sleeping arrangements were unrelated to the between-family difference in initial status of coparenting quality, the initial status of mothers' depressive symptoms, nor the trajectories of mothers' depressive symptoms.

Built on family systems theory, it was expected that the associations between family functioning, infants' and parents' sleep, and parents' well-being would be bidirectional, yet the results of the present study suggested that family processes (changes in family functioning over time) was only associated with mothers' depression. The primary reason for this discrepancy was that, because the latent linear growth models for other individual functioning (infants' and mothers' sleep fragmentation, and fathers' depression) were a less than satisfactory fit to the data, the present study was unable to further examine the associations between family processes and these variables. This suggests that the trajectories of these individual functionings may not be linear. In support of this, prior work demonstrated a non-linear trend of the trajectories of infants' night waking (Henderson, France, Owens, & Blampied, 2010; Moore & Ucko, 1957; Sacher, 1991; So et al., 2007) and mothers' sleep fragmentation (Teti et al., 2016). For example,

a longitudinal survey study demonstrated that the frequency of infant night waking declined from 3 to 6 months of age, yet increased at 9 months, and leveled off at 12 months (Sacher, 1991). Another longitudinal study using actigraphs and sleep diaries reported that the length of the longest night waking decreased at 7 months, following a slight increase at 8 months, and decreased again from 9 to 12 months (So et al., 2007). Further, a longitudinal study using actigraphs reported that the trajectory of mothers' sleep fragmentation was a quadratic trend, with a gradual decrease from 1 to 6 months by following a period of little decline, although a linear trend was more predominated than the quadratic trend (Teti et al., 2016). Because there has been relatively little research on the trajectory of fathers' depression during the first year of infants' life, it is unclear whether the trajectories of fathers' depression is a non-linear trend. Nonetheless, given the empirical evidence that demonstrated a non-linear trend of the trajectories of infants' and mothers' night waking, it can be assumed that a non-linear trend of the trajectories of infants' and mothers' sleep, and, probably, fathers' depression, may have prevented from further examinations of the associations between family processes and the trajectories of these individual functionings over time.

The results of the present study also revealed that coparenting quality at 1 month did not significantly covary with fathers' sleep fragmentation at 1 month, and greater coparenting quality over time did not predict a decrease in fathers' sleep fragmentation over time. This indicated that the trajectories of coparenting quality and fathers' sleep fragmentation may not be the parallel processes. A possible explanation for this result is that fathers' sleep quality may be indirectly associated with coparenting quality through mothers' sleep quality. A closer look at the correlations between coparenting quality and fathers' and mothers' sleep quality suggested that fathers' sleep fragmentation at 1 month was positively associated with mothers' sleep

fragmentation at 1 month. Further, mothers' sleep fragmentation was stable across the first year, and associated with poorer coparenting quality during the second half of the first year. This suggests that fathers' sleep may be indirectly associated with coparenting quality through mothers' sleep fragmentation. This is consistent, in part, with the prior work which demonstrated that mothers' sleep was more likely than fathers' sleep to be compromised after the birth of a child (McDaniel & Teti, 2012; Tikotzky et al., 2011), and that mothers tended to view their coparenting quality more critically than fathers (McDaniel & Teti, 2012). The correlational analyses of the present study further suggested that poorer coparenting quality at 6 months was concomitantly and predictively associated with a higher level of both parents' depression at 6 and 9 months, which was, in turn, associated with greater infants' fragmented sleep at 9 months. This result indicates the intricate lagged associations between parents' sleep, family functioning, parents' well-being, and infants' sleep, and represents an important focus for future research.

Family functioning, child outcomes, and infant sleeping arrangements

The second hypothesis of the present study was that family processes would predict infant sleep quality and socio-emotional development at 24 months (infants' sleep quality, attachment, externalizing and internalizing behavioral problems, dysregulation, and competence) and (b) these associations would be independent of the sleep arrangements parents used. These hypotheses were supported for internalizing behavioral problems, dysregulation, and competence. The results suggested that greater coparenting quality over time was predictive of fewer externalizing problems, less dysregulation, and more competency of the child at 24 months, independent of whatever sleeping arrangements parents used across the first year. More importantly, sleeping arrangements were related to none of the child outcomes at 24 months.

As expected, the results of the present study suggested that coparenting quality that was

higher than the mean level over time predicted fewer externalizing problems, less dysregulation, and more competency of the child at 24 months, independent of whatever sleeping arrangements parents used across the first year. This was consistent with the prior work which demonstrated the children from harmonious, cohesive families are free of adjustment problems (Barber & Buehler, 1996; Jacobvits et al., 2004; Johnson, 2003; McHale & Rasmussen, 1998; Richmond & Stocker, 2006; Sturge-Apple et al., 2010). Particularly, the finding of the present study was consistent with Johnson's longitudinal study (2003), which examined the influence of changes in family functioning on children's emotional and behavioral problems during the transition to elementary school. She found that, when families were cohesive over time, their children were free from externalizing problems, but when families were not cohesive over time, their children tended to exhibit externalizing behavior.

Contrary to the hypothesis, the result of the present study suggested that family processes (coparenting quality over time) during the first year did not predict children's internalizing behavioral problems at 24 months. However, empirical evidence has supported the null hypothesis regarding the association between family cohesion (i.e., greater coparenting quality) and children's internalizing problems.

Family systems theory posits two extreme types of family dysfunction: enmeshment and disengagement (Minuchin, 1974). For example, an enmeshed mother-child subsystem would exclude the father by creating a rigid cross-generational coalition against the father. As a result, the child's autonomous exploration and mastery of problem-solving skills would be discouraged by the intrusive mother. In contrast, disengaged families may be indifferent to guiding a child's autonomy development. Later, Olson, Russel, and Sprenkle (1983) extended this model and defined the midrange of the continuum as cohesion, which is considered the optimal family

functioning. Family research has demonstrated that children from harmonious, cohesive families are healthy and free of adjustment problems, whereas children from enmeshed families are more likely than children in disengaged families to exhibit emotional problems, and children from disengaged families are at risk for emotional as well as behavioral adjustment problems (Barber & Buehler, 1996; Jacobvits et al., 2004; Johnson, 2003; McHale & Rasmussen, 1998; Richmond & Stocker, 2006; Sturge-Apple et al., 2010). However, the present study only assessed the degree to which how parents work as a team in infant-care, and did not assess other types of family functioning such as enmeshment or disengagement. That is, the present study only assessed coparenting, the quality of which is expected to contribute to family cohesion. This may lead to the null association between coparenting quality over time and children's internalizing problems at a later age.

Contrary to hypotheses, coparenting quality over time did not significantly predict infant sleep fragmentation or attachment security at 24 months. There are several explanations for these results. Regarding the non-significant association between the trajectories of coparenting over time and infants' sleep quality at a later age may have to do with the age at which children's sleep quality was assessed in the present study. Past work suggests that children's sleep consolidates around 6 months when a diurnal pattern of long sleep at night and long waking periods during the day emerges (Galland, Taylor, Elder, & Herbison, 2012; Henderson, France, Owens, & Blampied, 2010; Henderson, France, & Blampied, 2011; Mindell et al., 2016; So, Adamson, & Horne, 2007; Wolfson, 1996). However, the balance between sleep at night and wakefulness during the day is not even until five to six years of life (Dhal, 1996; Lushington, Pamula, Martin, & Kennedy, 2013; Wolfson, 1996). That is, infant sleep may be largely a biological development until children reach school-age. This suggests that it may have been too

early to examine the effect of family processes on children's sleep quality at 24 months. Of course, this assumption needs to be empirically supported in future research.

As for the effect of coparenting quality over time on attachment security at 24 months, the non-significant association between the two variables may be related to a precursor of parent-child attachment. Attachment research has demonstrated that individual differences in attachment security depended on mothers' availability and responsiveness (e.g., Ainsworth, Blehar, Waters, & Wall, 1978). For example, mothers of securely attached infants were found to be able to perceive her infant's signals, interpret them accurately, and respond contingently and appropriately (Ainsworth et al., 1978). In contrast, mothers of insecurely attached infants were controlling, overstimulating, intrusive, ignoring, and rejecting, or they responded to the infants' signals inconsistently (Ainsworth et al., 1978). Meta-analyses have shown that maternal sensitivity, or mothers' emotional availability, predicted attachment security (Atkinson et al., 2000, De Wolf & van IJzendorrn, 1997; Goldsmith & Alansky, 1987). Thus, a possible explanation for the null association between coparenting quality in the first year and attachment security at 24 months is that mothers' emotional availability may moderate the association between coparenting and attachment. For example, a longitudinal study examining the associations between coparenting quality, maternal availability at bedtime, and ecological variables (maternal depression, mothers' and infants' sleep quality, and infant temperament) during infants' first 6 months reported a significant association between coparenting quality and mothers' emotional availability at bedtime, after controlling for the effects of ecological variables, such that more positive coparenting quality predicted higher maternal availability at bedtime, whereas more negative coparenting quality predicted poorer maternal availability (Kim & Teti, 2014). Another longitudinal study examining the association between the trajectories of

maternal availability at bedtime and children's attachment security at 12 months revealed that emotional availability of the mothers who well adapted to infants' developmental needs during the first 6 months of infants' life predicted greater infant attachment security at 12 months (Kim, Chow, Bray, & Teti, 2017). Together with the result of the present study, which suggested that coparenting quality during the first year did not significantly predict children's attachment security at a later age, the results of these prior studies indicate that the association between family processes and children's attachment security may be moderated by mothers' emotional availability at bedtime and perhaps in other family contexts.

Limitations and future directions

Several limitations need to be mentioned. First, as noted above, it was unfortunate that the latent linear growth models for infants' sleep quality, mothers' sleep quality, and, in part, fathers' depression were a less than satisfactory fit to the data, and thus it was impossible to further examine the associations between family processes and these variables. Because the trajectories of these variables may not be linear, the latent growth models with a polynomial trend may successfully examine the parallel processes of the trajectories of coparenting, infants' sleep quality, mothers' sleep quality, and fathers' depression. Future investigations may benefit by including a polynomial time trend into the models when performing the latent growth modeling. Second, the present study utilized the Coparenting Relationship Scale (CRS; Feinberg et al., 2012) to determine family functioning at each time point. The usage of parental reports in the present study may create participant biases, evinced by the prior work that demonstrated the inter-parental discrepancies in coparenting scores within families (Van Egeren, 2004). Subjective assessments, such as observations of family interactions, may reduce these biases. Lastly, the present study utilized regression analyses (i.e., the latent growth modeling), and thus

the causal associations between family functioning, individual functioning, children's developmental outcomes, and infant sleeping arrangements may not be warranted.

To summarize, the results of the present study suggested that adaptive family processes and mothers' depression in the first year were the parallel processes in an opposite direction: greater adaptive family processes over time predicted a decrease in maternal depression over time, and that greater adaptive family processes over time were predictive of children's fewer externalizing problems, less dysregulation, and more competency at 24 months. Importantly, the effect of family processes on mothers' depression in the first year, and children's behavior problems, regulation, and competency at later age was found regardless of the types of sleeping arrangements parents used across the first year. Sleeping arrangements were, indeed, unrelated to any of the mothers' functioning and the child's socio-emotional development. Collectively, what appears clear from the present study is that it may not be sleeping arrangements *per se* but how the family works as a team over time that is associated with mothers' well-being and children's socio-emotional development.

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General Discussion

Past studies in Western countries have reported the negative impact of co-sleeping practices on children's sleep, family life, and children's socio-emotional development. Co-sleeping is associated with children's insufficient sleep (Sadeh, Mindell, Luedtke, & Wiegand, 2009), persistent night waking and increased bedtime struggles (Deleon & Karraker, 2007; Mindell, Meltzer, Carskadon, & Chrvin, 2009; Ramos, Youngclarke, & Anderson, 2007), maternal depression (Cortesi, Giannotti, Sebastiani, Vagnoni, & Marioni, 2008; Teti et al., 2015), family and couple distress (Cortesi et al., 2008), and children's emotional and behavioral problems in school (Cortesi et al., 2008).

However, contrary to the results noted above, other studies have not supported the premise that co-sleeping undermines children's healthy development and sleep quality (Keller & Goldberg, 2004; Okami, Weisner, & Olmsted, 2002; Teti, Shimizu, Crosby, & Kim, 2016; Volkovich, Ben-Zion, Karny, Meiri, & Tikotzky, 2015). This suggests that infant sleep arrangements *per se* may not be a determinant of sound child development.

This dissertation was motivated by the commonly-held Western perspective that co-sleeping is predictive of unfavorable family health, infants' sleep, and child development. It aimed to address the contradictions in literature regarding the consequences of infant sleeping arrangements and examine in detail the linkages between infant sleeping arrangements, family life, and infant sleep and development, through cultural and family systems perspectives.

Given the empirical evidence that family health may be a product of the degree to which there is a match between parental beliefs about sleep arrangements and what parents actually do, and the degree to which there is inter-parental agreement in parenting beliefs (Germo, Keller, & Goldberg, 2007), Study I examined the associations between parenting beliefs, sleeping

arrangements, and mothers' perceptions of infant sleep behavior, and whether European American families or ethnic minority families are at risk for elevated family stress and perceived child sleep problems when they choose persistent co-sleeping arrangements for their infants. Based on family systems theory which posits that the processes that change or maintain the patterns of interaction in the family (family processes) influence family life and child development, Study II examined whether sleeping arrangements *per se* or family processes influence infants' sleep, parents' sleep, and parents' well-being in the first year, and children's sleep and socio-emotional development at a later age.

This dissertation extends the existing literature in several ways. First, it demonstrates evidence of ethnic group differences in mothers' perceptions of their infants' sleep behavior between mothers of solitary sleeping infants and persistently co-sleeping mothers. Second, it indicates ethnic group differences in spill-over effects of discrepancies in parenting beliefs about choices of sleeping arrangements on family functioning between families of solitary sleeping infants and persistently co-sleeping families. Third, it suggests a strong association between greater coparenting quality and a reduction in maternal depression, independent of whatever sleeping arrangements parents used across the first year. Fourth, it highlights the strong associations between greater coparenting quality and children's healthier socio-emotional development at a later age, irrespective of whatever sleeping arrangements parents used across the first year.

Together, this dissertation demonstrates that (1) it is not sleeping arrangements *per se* but a mismatch between cultural beliefs about sleep arrangements and what parents actually do that leads co-sleeping mothers to be sensitive to infant sleep behaviors and vulnerable to a risk for unfavorable family functioning, and (2) it is not sleeping arrangements *per se* but family

processes that play an important role in parents' well-being and children's socio-emotional development.

Ethnic group differences in mothers' perceptions of their infants' sleep behavior between mothers of solitary sleeping infants and persistently co-sleeping mothers

The results of Study I revealed the differences in mothers' perception of frequencies of their infant night waking and problematic night waking between mothers who persistently co-slept with their infants beyond 6 months and mothers whose infants slept in a separate room only among European American families. These results are consistent with prior work showing that, among Western European mothers, when there is a mismatch between cultural norms about how to structure infant sleeping arrangements and the sleeping arrangements parents are using, mothers are more likely to notice their child's sleep disruptions and view them as problematic than when the cultural norms match their choices of sleeping arrangements (Luikj et al., 2013). On the other hand, although ethnic minority mothers who co-slept with their infant beyond 6 months reported greater difficulties in putting the infant to sleep than mothers who used solitary sleeping by 6 months, sleeping arrangements were unrelated to mothers' perceptions of frequencies of infant night waking and problematic night waking. This may reflect their collectivistic value orientation that prioritizes the need of the infants over their own needs (Markus & Kitayama, 1991; Triandis, 1995). Although ethnic minority mothers who persistently co-sleep with their infants face their children's bedtime struggles, they may be more likely than European American mothers to have greater tolerance to their infants' night waking as a process of normal child development (Lee, 1992, and Latz, Wolf, & Lozoff, 1999).

Ethnic group differences in spill-over effects of discrepancies in parenting beliefs about choices of sleeping arrangements on family functioning between families of solitary sleeping infants and persistently co-sleeping families

The results of Study I also showed that when mothers were more likely than fathers to endorse close parent-child relationships, mothers' perception of positive coparenting decreased and negative coparenting increased among European American mothers who co-slept with their infant beyond 6 months. On the other hand, sleeping arrangements were unrelated to the association between inter-parental discrepancies in endorsement of close parent-child relationships and mothers' perception of coparenting quality among ethnic minority families. These findings build upon Geramo et al.'s report (2007) that the discrepancies between parents in parenting beliefs regarding sleeping arrangements may lead to greater co-parental conflict, by demonstrating that co-sleeping practices were associated with the spill-over effects of discrepancies in parenting beliefs on co-parental relationships only when the utility of co-sleeping was dissonant with one's cultural norms. The results from Study I in this dissertation suggest that it may be not co-sleeping mothers in general but the persistently co-sleeping European American mothers who are at risk for unfavorable family functioning, particularly when mothers are more likely than their partner to endorse close parent-child relationships as a reason for co-sleeping with their infants.

Further, the results of additional analyses revealed that European American mothers' perception of poor coparenting quality at 1 month led them to bring their infants into a bedroom at 3 months. These results may support family systems theory's principle of mother-child enmeshment (Minuchin, 1974). These results are also in line with the implications of previous work suggesting that persistent co-sleeping throughout the infant's first year, particularly in a

culture where parent-child co-sleeping beyond 6 months is not endorsed, may be a maker of heightened family stress (Teti & Crosby, 2012; Teti et al., 2016). The results from Study I in this dissertation extend these prior studies, demonstrating that when European American mothers perceive poor alliance with their partner, they bring their infant to a bedroom, possibly as a way of compensating for a lack of closeness with their partner.

An association between coparenting quality and mothers' well-being, independent of whatever sleeping arrangements parents used across the first year

The results from Study II in this dissertation shed light on the importance of family functioning on mothers' well-being in sleep contexts. The findings revealed that coparenting quality and mothers' depression were the parallel processes in an opposite direction – greater coparenting quality at 1 month were associated with less maternal depression at 1 month, and greater coparenting quality over time was predictive of a reduction in mothers' depression over time. More importantly, this association was found, irrespective of whatever sleeping arrangements parents used across the first year. Indeed, sleeping arrangements were unrelated to the initial status of coparenting quality, the initial status of mothers' depressive symptoms, nor the trajectories of mothers' depression. These results did not support the findings of the previous work which demonstrated that co-sleeping with children was associated with a higher level of maternal depression (Cortesi et al., 2008; Teti et al., 2015), and provide new insight to the literature by showing that it is not sleeping arrangements *per se* but family processes that are associated with mothers' well-being.

The associations between coparenting quality and children's socio-emotional development, independent of whatever sleeping arrangements parents used across the first year

The results from Study II in this dissertation also suggest an important role of family

processes on children's socio-emotional development, regardless of the types of sleeping arrangements parents use for their children. Contrary to the notions by pediatric professionals and parenting educators that co-sleeping may increase children's dependency on parents, and thus may compromise the development of children's self-regulatory skills (Brazelton & Sparrow, 2003; Connell-Carrick, 2006; Ramon et al., 2007; Spock & Needlman, 2011), the findings of Study II in this dissertation suggested that sleeping arrangements in infancy were unrelated to children's sleep quality, attachment security, externalizing and internalizing problems, dysregulation, nor competence at a later age. These results did not support the findings of the previous work which reported a strong association between co-sleeping practices and children's emotional and behavioral problems (Cortesi et al., 2008). The results of Study II in this dissertation suggest that it is not sleeping arrangements *per se* but family processes that are predictive of children's healthy socio-emotional development, demonstrating that greater family processes in the first year predicted children's fewer externalizing problems, more regulation, and more competence at 24 months, independent of whatever sleeping arrangements parents used across the first year. Together with the association between family processes and mothers' well-being discussed above, Study II in this dissertation highlights the important roles of family processes on parents' well-being and children's socio-emotional development, over and above the effect of sleeping arrangements.

Future directions

There are several recommendations for future work involving infant sleeping arrangements. Study I tested two models, the model assessing differences in an outcome using infant sleeping arrangements and ethnicity as separate level-2 predictors (Model 1), and the model assessing whether differences in a child outcome by sleeping arrangements depended on

families' ethnicity (Model 2). There was noteworthy discrepancies in the results between these two models. The results of Model 1 suggested that co-sleeping was associated with mothers' perception of higher levels of infant sleep disruptions, but mothers' ethnicity was unrelated to mothers' perception of infant sleep disruptions. However, Model 2 showed that the differences in mothers' perception of infant sleep disruptions between the two patterns of sleeping arrangements were found only among EA families. Regarding parents' perceptions of coparenting relationships, the results of Model 1 suggested that sleeping arrangements were unrelated to mothers' perception of coparenting quality. Yet, Model 2 revealed that it was persistently co-sleeping European American mothers who reported lower quality of coparenting relationships, but sleeping arrangements were unrelated to mothers' perception of coparenting quality among ethnic minority families. Further, Model 1 suggested that when mothers were more likely than fathers to endorse close parent-child relationships as a reason for choosing sleeping arrangements, mothers' perception of positive coparenting decreased and negative coparenting increased among mothers who persistently co-slept with their infants. Yet, the results of Model 2 revealed that it was persistently co-sleeping European American mothers whose perception of positive coparenting decreased and negative coparenting increased when mothers were more likely than fathers to endorse close parent-child relationships. Sleeping arrangements were unrelated to the association between inter-parental discrepancies in endorsement of close parent-child relationships and coparenting quality among ethnic minority families. Together, these discrepancies between the model using infant sleeping arrangements and ethnicity as separate predictors and the model assessing the interactions between sleeping arrangements and ethnicity suggest that the results of the former model may be misleading. Indeed, past work that demonstrated a strong association between co-sleeping and infants' sleep

disruptions utilized the Model 1 approach, overlooking the differences in one's cultural norms and values (Mao, Burnham, Goodlin-Jones, Gaylor, & Anders, 2004; Mindell et al., 2009; Sadeh et al., 2009). This may lead to the controversies regarding the negative consequences of co-sleeping in the literature. Thus, future work involving infant sleeping arrangements should explore ethnic group differences in cultural expectations regarding how parents structure infant sleep and what is considered normal or problematic infant sleep.

The results of Study II in this dissertation suggest that, in contrast to common views that persistent co-sleeping is linked to negative consequences in family life and child development, sleeping arrangements *per se* is not a direct influence on parents' well-being and child development. This suggests that future work must pay greater attention to the overall health of the family systems, instead of arguing about the benefits or pitfalls of infant sleeping arrangements.

Conclusion

This dissertation was motivated by the commonly-held Western view that persistent co-sleeping is predictive of unfavorable family health, infants' sleep, and child development. It aimed to address the controversies regarding infant sleeping arrangements, child development, and family life to better understand the practice of co-sleeping, and of sleeping arrangements in general, through cultural and family systems perspectives. Studies in this dissertation suggest that it is not sleeping arrangements *per se* but a mismatch between cultural beliefs about sleep arrangements and what parents actually do that leads co-sleeping mothers to be sensitive to infant sleep behaviors and vulnerable to a risk for unfavorable family functioning, and that it is not sleeping arrangements *per se* but family processes that play an important role in mothers' well-being and children's socio-emotional development. This dissertation adds new insight to

the literature by demonstrating the importance of including cultural and family systems perspectives in studies involving sleeping arrangements. I hope that the findings generated by this dissertation are directly relevant to parents, pediatric professionals, and parenting educators, helping them to focus less on the utility of particular sleeping arrangements and instead increasing their awareness of the importance of the cultural influences on parents' perceptions regarding infant sleep and the health of the family systems on one's well-being and child development.

General Introduction and Discussion References

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